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# CHEMICAL TABLES.

BY

STEPHEN P. SHARPLES, S.B.

CAMBRIDGE:
SEVER AND FRANCIS,
BOOKSELLERS TO THE UNIVERSITY.
1866.

Entered according to Act of Congress, in the year 1866, by

S. P. SHARPLES,

in the Clerk's Office of the District Court of the District of Massachusetts.

UNIVERSITY PRESS: WELCH, BIGELOW, & CO.,
CAMBRIDGE.

# PREFACE.

THE following work was undertaken at the suggestion of Dr. Wolcott Gibbs, and has been executed under his immediate supervision. No labor has been spared to render the collection of tables as complete as possible, and to insure perfect accuracy in the figures. In all cases the tables have been taken from the original sources, or have been carefully compared with them. The tables on pages 94 – 99, 100 – 108, are new, and have been computed expressly for this work: the logarithms at the end of the volume are taken from the well-known five-figure table of August.

Many tables have been introduced, which are not in common use in the laboratory. This has been done partly for the sake of completeness, but principally because the progress of science continually brings the physical and chemical properties of bodies into closer relations with each other. Thus the researches of Landolt have recently shown that the chemical constitution of a mixture or compound may, in many cases, be deduced with accuracy from its optical properties alone.

The tables usually found in works on chemistry, giving the vapor densities of bodies referred to air taken as unity, have been omitted in this work, for the reason that it is always more convenient to refer gases and vapors to hydrogen as the unit of density as well as of weight and volume, and the vapor density is then very simply and directly related to the atomic weight.

The table of wave lengths on page 148 will be found convenient for use in connection with Kirchhoff's chart of the spectrum. With its assistance the wave length of any observed line may be determined with sufficient accuracy by the ordinary methods of interpolation.

The Editor will be greatly obliged for any criticisms or suggestions which may enable him to render the work more perfect in case it should pass to a second edition.

S. P. S.

LAWRENCE SCIENTIFIC SCHOOL,
Cambridge, June, 1866.

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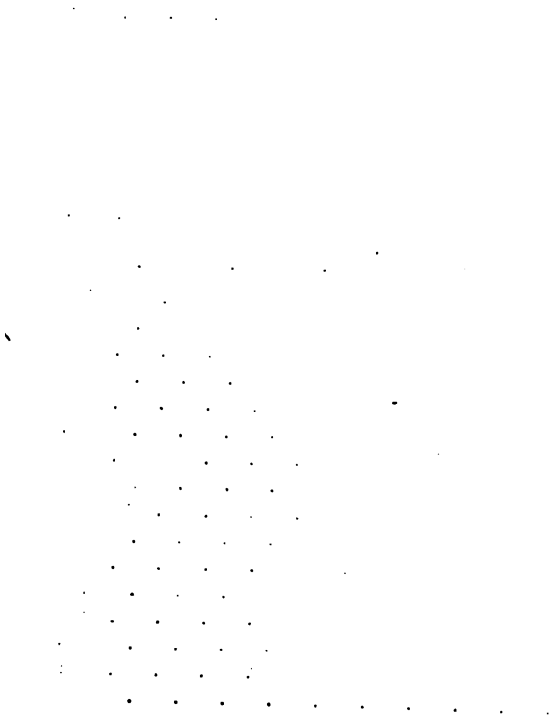

# TABLES

FOR THE

# CALCULATION OF ANALYSES.

# TABLE

## OF THE ELEMENTS AND THEIR EQUIVALENTS.

| Element. | Symbol. | Equivalent. | Log. | Remarks. |
|---|---|---|---|---|
| Aluminum | Al | 13.75 | 1.138303 | |
| Antimony | Sb | 120.00 | 2.079181 | 122 Dexter, 120.3 Schneider. |
| Arsenic | As | 75.00 | 1.875061 | |
| Barium | Ba | 68.50 | 1.835691 | 68.59 Marignac. |
| Bismuth | Bi | 208.00 | 2.318063 | |
| Boron | B | 11.00 | 1.041393 | 11.04 Berzelius. |
| Bromine | Br | 80.00 | 1.903090 | 79.97 Marignac. |
| Cadmium | Cd | 56.00 | 1.748188 | |
| Cæsium | Cs | 133.00 | 1.123852 | |
| Calcium | Ca | 20.00 | 1.301030 | |
| Carbon | C | 6.00 | 0.778151 | |
| Cerium | Ce | 46.00 | 1.662758 | |
| Chlorine | Cl | 35.50 | 1.550228 | 35.46 Marignac. |
| Chromium | Cr | 26.00 | 1.414973 | 26.24 Berlin, Peligot. |
| Cobalt | Co | 30.00 | 1.477121 | |
| Copper | Cu | 31.75 | 1.501744 | 31.73 Erdmann & Marchand. |
| Didymium | D | 48.00 | 1.681241 | |
| Erbium | E | 56.30 | 1.750508 | |
| Fluorine | F | 19.00 | 1.278754 | |
| Glucinum | G | 4.66 | 0.668386 | |
| Gold | Au | 197.00 | 2.294466 | 196.67 Berzelius. |
| Hydrogen | H | 1.00 | 0.000000 | |
| Indium | In | 37.00 | 1.568202 | |
| Iodine | I | 127.00 | 2.103804 | |
| Iridium | Ir | 98.00 | 1.991226 | |
| Iron | Fe | 28.00 | 1.447158 | |
| Lanthanum | La | 47.00 | 1.672098 | 46.4 Holzmann. |
| Lead | Pb | 103.50 | 2.014940 | 103.57 Berzelius. |
| Lithium | L | 7.00 | 0.845098 | 6.95 Mallet. |
| Magnesium | Mg | 12.00 | 1.079181 | [Hauer. |
| Manganese | Mn | 27.00 | 1.431364 | 27.57 Berzelius, 27.5 Von |
| Mercury | Hg | 100.00 | 2.000000 | 100.05 Erdmann & Marchand. |
| Molybdenum | Mo | 46.00 | 1.662758 | |
| Nickel | Ni | 29.00 | 1.462398 | |
| Niobium | Nb | 94.00 | 1.973128 | When $NbO_5$ = Niobic acid. |
| Nitrogen | N | 14.00 | 1.146128 | |

| Element. | Symbol. | Equivalent. | Log. | Remarks. |
|---|---|---|---|---|
| Osmium | Os | 97.00 | 1.986772 | 99.82 Fremy. |
| Oxygen | O | 8.00 | 0.903090 | |
| Palladium | Pd | 53.20 | 1.725912 | 53.24 Berzelius. |
| Phosphorus | P | 31.00 | 1.491362 | |
| Platinum | Pt | 99.00 | 1.995635 | 98.94 Andrews. |
| Potassium | K | 39.00 | 1.591065 | 39.11 Marignac. |
| Rhodium | R | 52.00 | 1.716003 | 52.16 Berzelius. |
| Rubidium | Rb | 85.40 | 1.931458 | |
| Ruthenium | Ru | 52.00 | 1.716003 | |
| Selenium | Se | 39.50 | 1.596597 | 39.41 Erdmann & Marchand. |
| Silicon | Si | 14.00 | 1.146128 | When Silicic acid = $SiO_2$. |
| Silver | Ag | 108.00 | 2.033424 | |
| Sodium | Na | 23.00 | 1.361728 | Clouze. |
| Strontium | Sr | 43.75 | 1.640978 | 43.67 Stromeyer, 43.85 Pe- |
| Sulphur | S | 16.00 | 1.204120 | |
| Tantalum | Ta | 172.00 | 2.235528 | When Tantalic acid = $TaO_5$. |
| Tellurium | Te | 64.00 | 1.806180 | 64.14 Berzelius. |
| Thallium | Tl | 204.00 | 2.309630 | |
| Thorium | Th | 118.00 | 2.071882 | When Thoria = $ThO_2$. |
| Tin | Sn | 58.00 | 1.763428 | |
| Titanium | Ti | 25.00 | 1.397940 | |
| Tungsten | W | 92.00 | 1.963788 | |
| Uranium | U | 60.00 | 1.778151 | |
| Vanadium | V | 68.50 | 1.835691 | 68.54 Berzelius. |
| Yttrium | Y | 30.85 | 1.489255 | |
| Zinc | Zn | 32.50 | 1.511883 | 32.52 Axel, Erdmann. |
| Zirconium | Zr | 44.80 | 1.651278 | When Zirconia = $ZrO_2$. |

# TABLE

## GIVING THE ELEMENTS ARRANGED IN NATURAL GROUPS; WITH THEIR MOLECULAR AND ATOMIC WEIGHTS.

### 1. *Monatomic Elements, or Elements usually equivalent to* 1 *Atom of Hydrogen.*

| Element. | Atomic Weight. | Molecular Weight. | Element. | Atomic Weight. | Molecular Weight. |
|---|---|---|---|---|---|
| Bromine | 80.00 | 160.00 | Lithium | 7.00 | 14.00 |
| Chlorine | 35.50 | 71.00 | Potassium | 39.00 | 78.00 |
| Cæsium | 133.00 | 266.00 | Rubidium | 85.40 | 170.80 |
| Fluorine | 19.00 | 38.00 | Silver | 108.00 | 216.00 |
| Gold | 197.00 | 394.00 | Sodium | 23.00 | 46.00 |
| Hydrogen | 1.00 | 2.00 | Thallium | 204.00 | 408.00 |
| Iodine | 127.00 | 254.00 | | | |

### 2. *Diatomic Elements, or Elements usually equivalent to* 2 *Atoms of Hydrogen.*

| Element. | Atomic Weight. | Molecular Weight. | Element. | Atomic Weight. | Molecular Weight. |
|---|---|---|---|---|---|
| Oxygen | 16.00 | 32.00 | Indium? | 74.00 | 148.00 |
| Sulphur | 32.00 | 64.00 | Cobalt | 60.00 | 120.00 |
| Selenium | 79.00 | 158.00 | Nickel | 58.00 | 116.00 |
| Tellurium | 128.00 | 256.00 | Cadmium | 112.00 | 224.00 |
| Calcium | 40.00 | 80.00 | Copper | 63.50 | 127.00 |
| Barium | 137.00 | 274.00 | Mercury | 200.00 | 400.00 |
| Strontium | 87.50 | 175.00 | Cerium | 92.00 | 184.00 |
| Lead | 207.00 | 414.00 | Didymium | 96.00 | 192.00 |
| Iron | 56.00 | 112.00 | Lanthanum | 94.00 | 188.00 |
| Manganese | 54.00 | 108.00 | Yttrium | 61.70 | 123.40 |
| Chromium | 52.00 | 104.00 | Erbium | 112.60 | 225.20 |
| Aluminum | 27.50 | 55.00 | Glucinum | 9.32 | 18.64 |
| Zinc | 65.00 | 130.00 | Uranium | 120.00 | 240.00 |
| Magnesium | 24.00 | 48.00 | | | |

### 3. *Triatomic Elements, or Elements usually equivalent to* 3 *Atoms of Hydrogen.*

| Element. | Atomic Weight. | Molecular Weight. | Element. | Atomic Weight. | Molecular Weight. |
|---|---|---|---|---|---|
| Nitrogen | 14.00 | 28.00 | Boron | 11.00 | ? |
| Phosphorus | 31.00 | 124.00 | Molybdenum? | 92.00 | ? |
| Arsenic | 75.00 | 300.00 | Tungsten? | 184.00 | ? |
| Antimony | 120.00 | 480.00 | Vanadium? | 137.00 | ? |
| Bismuth | 208.00 | 832.00 | | | |

4. *Tetratomic Elements, or Elements usually equivalent to 4 Atoms of Hydrogen.*

| Element. | Atomic Weight. | Molecular Weight. | Element. | Atomic Weight. | Molecular Weight. |
|---|---|---|---|---|---|
| Carbon | 12.00 | 24.00 ? | Osmium | 194.00 | 388.00 ? |
| Silicon | 28.00 | 56.00 ? | Palladium | 106.40 | 212.80 ? |
| Zirconium | 89.60 | 179.20 ? | Platinum | 198.00 | 396.00 ? |
| Thorium | 236.00 | 472.00 ? | Iridium | 196.00 | 392.00 ? |
| Tin | 116.00 | 232.00 ? | Rhodium | 104.00 | 208.00 ? |
| Titanium | 50.00 | 100.00 ? | Ruthenium | 104.00 | 208.00 ? |

5. *Pentatomic Elements, or Elements usually equivalent to 5 Atoms of Hydrogen.*

| Element. | Atomic Weight. | Molecular Weight. | Element. | Atomic Weight. | Molecular Weight. |
|---|---|---|---|---|---|
| Tantalum | 344.00 | 688.00 ? | Niobium | 198.00 | 396.00 ? |

# TABLE

OF THE FORMULAS, EQUIVALENTS, AND PER CENTS OF THE CONSTITUENTS, OF THE MOST FREQUENTLY OCCURRING COMPOUNDS.

| Combination. | Formula. | Equivalent. | Per cent of Constituents. |
|---|---|---|---|
| | **Bromides.** | | |
| Bromide of Potassium | KBr | 119.00 | K 32.77 Br 67.23 |
| " Silver | AgBr | 188.00 | Ag 57.45 Br 42.55 |
| " Sodium | NaBr | 103.00 | Na 22.33 Br 77.67 |
| | **Chlorides.** | | |
| Chloride of Ammonium | $NH_4Cl$ | 53.50 | $NH_4$ 33.65 Cl 66.35<br>$NH_3$ 31.78 HCl 68.22 |
| " Ammonium & Platinum | $NH_4Cl$, $PtCl_2$ | 223.50 | $NH_4$ 8.06 Pt 44.29 Cl 47.65 ; or,<br>$NH_4Cl$ 23.94 $PtCl_2$ 76.06 ; or,<br>$NH_3$ 7.60 HCl 16.34 $PtCl_2$ 76.06<br>N 6.26 H 1.79 Cl 47.65 Pt 44.30 |
| " Barium | BaCl | 104.00 | Ba 65.86 Cl 34.14 |
| " " Crystal. | BaCl + 2HO | 122.00 | Ba 56.15 Cl 29.09 HO 14.76 |
| " Calcium | CaCl | 55.50 | Ca 36.04 Cl 63.96 |
| " Cobalt | CoCl | 65.50 | Co 45.80 Cl 54.20 |
| " " Crystal. | CoCl + 6HO | 119.50 | Co 25.10 Cl 29.71 HO 45.19 |
| " Copper | CuCl | 67.25 | Cu 47.21 Cl 52.79 |
| " " Sub | $Cu_2Cl$ | 99.00 | Cu 64.15 Cl 35.85 |
| " Gold | $AuCl_3$ | 303.50 | Au 64.91 Cl 35.09 |
| " Iron Proto | FeCl | 63.50 | Fe 44.10 Cl 55.90 |
| " " Sesqui | $Fe_2Cl_3$ | 162.50 | Fe 34.46 Cl 65.54 |

| Combination. | Formula. | Equivalent. | Per cent of Constituents. |
|---|---|---|---|
| Chloride of Lead | PbCl | 139.00 | Pb 74.46 Cl 25.54 |
| " Magnesium | MgCl | 47.50 | Mg 25.26 Cl 74.74 |
| " Manganese | MnCl | 62.50 | Mn 43.20 Cl 56.80 |
| " " Crystal. | MnCl + 4HO | 98.50 | Mn 27.41 Cl 36.04 HO 36.55 |
| " Mercury | HgCl | 135.50 | Hg 73.80 Cl 26.20 |
| " " Sub | $Hg_2Cl$ | 235.50 | Hg 84.92 Cl 15.08 |
| " Platinum | PtCl | 134.50 | Pt 73.61 Cl 26.39 |
| " " Bi | $PtCl_2$ | 170.00 | Pt 58.23 Cl 41.77 |
| " Potassium | KCl | 74.50 | K 52.35 Cl 47.65 |
| " " & Platinum | KCl, $PtCl_2$ | 244.50 | KCl 30.47 $PtCl_2$ 69.53 ; or, K 15.95 Pt 40.49 Cl 43.56 |
| " Silver | AgCl | 143.50 | Ag 75.26 Cl 24.74 |
| " Sodium | NaCl | 58.50 | Na 39.32 Cl 60.68 |
| " Tin Bi | $SnCl_2$ | 129.00 | Sn 44.96 Cl 55.04 |
| " " Crystal. | SnCl + 2HO | 111.50 | Sn 52.02 Cl 31.84 HO 16.14 |
| " " Proto | SnCl | 93.50 | Sn 62.03 Cl 37.97 |
| " Zinc | ZnCl | 68.00 | Zn 47.79 Cl 52.21 |
| **Cyanides.** | | | |
| Cyanogen = Cy | $C_2N$ | 26.00 | C 46.15 N 53.85 |
| Cyanide of Mercury | HgCy | 126.00 | Hg 79.36 Cy 20.64 |
| " Palladium | PdCy | 79.20 | Pd 67.18 Cy 32.82 |
| " Potassium | KCy | 65.00 | K 60.00 Cy 40.00 |
| " Silver | AgCy | 134.00 | Ag 80.59 Cy 19.41 |
| Ferricyanide of Potassium | 3KCy, $Fe_2Cy_3$ | 329.00 | KCy 59.27 $Fe_2$ $Cy_3$ 40.73 |
| Ferrocyanide of Potassium | 2KCy, FeCy + 3HO | 211.00 | KCy 61.61 Fe Cy 25.59 HO 12.80 |
| Sulphocyanide of Potassium | $KCyS_2$ | 97.00 | K 40.20 Cy 26.81 S 32.99 |

| | | | |
|---|---|---|---|
| **Fluorides.** | | | |
| Fluoride of Ammonium | $NH_4F$ | 37.00 | $NH_4$ 48.65 F 51.35 |
| " Calcium | $CaF$ | 39.00 | Ca 51.28 F 48.72 |
| " Sodium & Aluminum | $3NaF, Al_2F_3$ | 210.50 | Na 32.77 Al 13.06 F 54.17 |
| " Potassium | $KF$ | 58.00 | K 67.24 F 32.76 |
| " Sodium | $NaF$ | 42.00 | Na 54.76 F 45.24 |
| Fluosilicate of Barium | $BaF, BF_3$ | 139.50 | Ba 49.10 Si 10.04 F 40.86 |
| " Potassium | $KF, SiF_2$ | 110.00 | K 35.45 Si 12.73 F 51.82 |
| Fluoborate of " | $KF, BF_3$ | 126.00 | K 30.95 B 8.73 F 60.32 |
| **Compounds of Hydrogen.** | | | |
| Hydrobromic acid | $HBr$ | 81.00 | H 1.24 Br 98.76 |
| Hydrochloric " | $HCl$ | 36.50 | H 2.74 Cl 97.26 |
| Hydrocyanic " | $HCy$ | 27.00 | H 3.71 Cy 96.29 |
| Hydrofluoric " | $HF$ | 20.00 | H 5.00 F 95.00 |
| Hydroiodic " | $HI$ | 128.00 | H 0.78 I 99.22 |
| Hydrosulphuric acid | $HS$ | 17.00 | H 5.88 S 94.12 |
| Ammonia | $NH_3$ | 17.00 | H 17.65 N 82.35 |
| **Iodides.** | | | |
| Iodide of Copper (Sub) | $Cu_2I$ | 190.50 | Cu 33.34 I 66.66 |
| " Mercury | $HgI$ | 227.00 | Hg 44.06 I 55.94 |
| " Palladium | $PdI$ | 180.20 | Pd 29.58 I 70.42 |
| " Potassium | $KI$ | 166.00 | K 23.48 I 76.52 |
| " Silver | $AgI$ | 235.00 | Ag 45.96 I 54.04 |
| " Sodium | $NaI$ | 150.00 | Na 15.34 I 84.66 |
| **Oxides.** | | | |
| Aluminum, Oxide | $Al_2O_3$ | 51.50 | Al 53.40 O 46.60 |
| Ammonium, Oxide | $NH_4O$ | 26.00 | $NH_4$ 69.23 O 30.77 |
| Antimony, Oxide | $SbO_4$ | 144.00 | Sb 83.35 O 16.65 |

| Combination. | Formula. | Equivalent. | Per cent of Constituents. |
|---|---|---|---|
| Antimonous Acid | $SbO_4$ | 152.00 | Sb 78.96 O 21.04 |
| Antimonic Acid | $SbO_5$ | 160.00 | Sb 75.01 O 24.99 |
| Arsenous Acid | $AsO_3$ | 99.00 | As 75.76 O 24.24 |
| Arsenic Acid | $AsO_5$ | 115.00 | As 65.22 O 34.78 |
| Barium, Oxide | $BaO$ | 76.50 | Ba 89.55 O 10.45 |
| " Hydrate | $BaO, HO$ | 85.50 | BaO 89.48 HO 10.52 |
| " Peroxide | $BaO_2$ | 84.50 | Ba 81.06 O 18.94 |
| Bismuth, Oxide | $BiO_3$ | 232.00 | Bi 89.65 O 10.35 |
| Boric Acid | $BO_3$ | 35.00 | B 31.43 O 68.57 |
| " " Crystal. | $BO_3 + 3HO$ | 62.00 | BO 56.44 HO 43.56 |
| Cadmium, Oxide | $CdO$ | 64.00 | Cd 87.50 O 12.50 |
| Calcium " | $CaO$ | 28.00 | Ca 71.43 O 28.57 |
| " Hydrate | $CaO, HO$ | 37.00 | CaO 75.67 HO 24.33 |
| Carbonic Oxide | $CO$ | 14.00 | C 42.86 O 57.14 |
| " Acid | $CO_2$ | 22.00 | C 27.27 O 72.73 |
| Chloric Acid | $ClO_5$ | 75.50 | Cl 47.02 O 52.98 |
| Chromic Acid | $CrO_3$ | 50.00 | Cr 52.00 O 48.00 |
| Chromium, Sesquioxide | $Cr_2O_3$ | 76.00 | Cr 68.42 O 31.58 |
| Cobalt, Oxide | $CoO$ | 38.00 | Co 78.94 O 21.06 |
| " Sesquioxide | $Co_2O_3$ | 84.00 | Co 71.43 O 28.57 |
| Cobalt, Protosesquioxide | $Co_3O_4$ | 122.00 | Co 73.77 O 26.23 |
| Copper, Oxide | $CuO$ | 39.75 | Cu 79.88 O 20.12 |
| " Suboxide | $Cu_2O$ | 71.50 | Cu 88.81 O 11.19 |
| Gold, Teroxide | $AuO$ | 221.00 | Au 89.14 O 10.86 |
| Hydrogen, Oxide | $HO$ | 9.00 | H 11.11 O 88.89 |
| " Peroxide | $HO_2$ | 17.00 | H 5.88 O 94.12 |
| Iodic Acid | $IO_5$ | 167.00 | I 76.05 O 23.95 |
| Iron, Oxide | $FeO$ | 36.00 | Fe 77.78 O 22.22 |

| | | | |
|---|---|---|---|
| Iron, Sesquioxide | $Fe_2O_3$ | 80.00 | Fe 70.00 O 30.00 |
| " Magnetic Oxide | $Fe_3O_4$ | 116.00 | Fe 72.41 O 27.59 |
| Lead, Suboxide | $Pb_2O$ | 215.00 | Pb 96.28 O 3.72 |
| " Oxide | PbO | 111.50 | Pb 92.83 O 7.17 |
| " Peroxide | $PbO_2$ | 119.50 | Pb 86.61 O 13.39 |
| Magnesium, Oxide | MgO | 20.00 | Mg 60.00 O 40.00 |
| " Hydrate | MgO, HO | 29.00 | MgO 68.97 HO 31.03 |
| Manganese, Oxide | MnO | 35.00 | Mn 77.14 O 22.86 |
| " Sesquioxide | $Mn_2O_3$ | 78.00 | Mn 69.23 O 30.77 |
| " Protosesquioxide | $Mn_3O_4$ | 113.00 | Mn 71.68 O 28.32 |
| " Peroxide | $MnO_2$ | 43.00 | Mn 62.79 O 37.21 |
| Manganic Acid | $MnO_3$ | 51.00 | Mn 52.94 O 47.06 |
| Permanganic Acid | $Mn_2O_7$ | 110.00 | Mn 49.09 O 50.91 |
| Mercury, Oxide | HgO | 108.00 | Hg 92.59 O 7.41 |
| " Suboxide | $Hg_2O$ | 208.00 | Hg 96.15 O 3.85 |
| Molybdic Acid | $MoO_3$ | 70.00 | Mo 65.71 O 34.29 |
| Nickel, Oxide | NiO | 37.00 | Ni 78.38 O 21.62 |
| Nitrogen, Oxide | NO | 22.00 | N 63.64 O 36.36 |
| " Deutoxide | $NO_2$ | 30.00 | N 46.67 O 53.33 |
| Nitrous Acid | $NO_3$ | 38.00 | N 36.84 O 63.16 |
| Nitric Acid | $NO_5$ | 54.00 | N 25.93 O 74.07 |
| " " Hydrate | HO, $NO_5$ | 63.00 | $NO_5$ 85.71 HO 14.29 |
| Oxalic Acid | $C_2O_3$ | 36.00 | C 33.33 O 66.67 |
| " " Crystal. | $C_2O_3 + 3HO$ | 63.00 | $\bar{O}$ 57.14 HO 42.86 |
| Phosphoric Acid | $PO_5$ | 71.00 | P 43.66 O 56.34 |
| " " Hydrated | HO, $PO_5$ | 80.00 | HO 11.25 $PO_5$ 88.75 |
| Pyrophosphoric Acid | 2HO, $PO_5$ | 89.00 | HO 20.23 $PO_5$ 79.77 |
| Phosphoric Acid, common | 3HO, $PO_5$ | 98.00 | HO 27.55 $PO_5$ 72.45 |
| Platinum, Binoxide | $PtO_2$ | 115.00 | Pt 86.08 O 13.92 |
| Potassium, Oxide | KO | 47.00 | K 82.94 O 17.06 |

| Combination. | Formula. | Equivalent. | Per cent of Constituents. |
|---|---|---|---|
| Potassium, Hydrate | KO, HO | 56.00 | KO 83.93 HO 16.07 |
| Silicic Acid | $SiO_2$ | 30.00 | Si 46.67 O 53.33 |
| Silver, Oxide | $Ag_2O$ | 116.00 | Ag 93.10 O 6.90 |
| Sodium, Oxide | NaO | 31.00 | Na 74.19 O 25.81 |
| " Hydrate | NaO, HO | 40.00 | Na 77.50 HO 22.50 |
| Strontium, Oxide | SrO | 51.75 | Sr 84.54 O 15.46 |
| Sulphuric Acid | $SO_3$ | 40.00 | S 40.00 O 60.00 |
| " " Hydrate | HO, $SO_3$ | 49.00 | $SO_3$ 81.63 O 18.37 |
| Sulphurous Acid | $SO_2$ | 32.00 | S 50.00 O 50.00 |
| Stannic Acid | $SnO_2$ | 74.00 | Sn 78.38 O 21.62 |
| Tin, Oxide | SnO | 66.00 | Sn 87.88 O 12.12 |
| Titanic Acid | $TiO_2$ | 41.00 | Ti 60.98 O 39.02 |
| Uranium, Oxide | UO | 68.00 | U 88.24 O 11.76 |
| " Sesquioxide | $U_2O_3$ | 144.00 | U 83.33 O 16.67 |
| " Protosesquioxide | $U_3O_4$ | 212.00 | U 84.91 O 15.09 |
| Zinc, Oxide | ZnO | 40.50 | Zn 80.24 O 19.76 |
| | **Sulphides.** | | |
| Ammonium, Sulphide | $NH_4S$ | 34.00 | $NH_4$ 52.94 S 47.06 |
| Antimony, Tersulphide | $SbS_3$ | 168.00 | Sb 71.43 S 28.57 |
| " Pentasulphide | $SbS_5$ | 200.00 | Sb 60.00 S 40.00 |
| Arsenic, Bisulphide | $AsS_2$ | 107.00 | As 70.09 S 29.91 |
| " Tersulphide | $AsS_3$ | 123.00 | As 60.98 S 39.02 |
| " Pentasulphide | $AsS_5$ | 155.00 | As 48.39 S 51.61 |
| Cadmium, Sulphide | CdS | 72.00 | Cd 77.78 S 22.22 |
| Carbon, Bisulphide | $CS_2$ | 38.00 | C 15.79 S 84.21 |
| Copper, Sulphide | CuS | 47.75 | Cu 66.49 S 33.51 |

| | | | |
|---|---|---|---|
| Copper, Subsulphide | $Cu_2S$ | 79.50 | Cu 79.87 S 20.13 |
| Iron, Sulphide | FeS | 44.00 | Fe 63.64 S 36.36 |
| " Bisulphide | $FeS_2$ | 60.00 | Fe 46.67 S 53.33 |
| Lead, Sulphide | PbS | 119.50 | Pb 86.61 S 13.39 |
| Mercury, Sulphide | HgS | 116.00 | Hg 86.21 S 13.79 |
| Molybdenum, Sulphide | $MoS_2$ | 78.00 | Mo 58.97 S 41.03 |
| Potassium, " | KS | 55.00 | K 70.91 S 29.09 |
| " Tersulphide | $KS_2$ | 87.00 | K 44.83 S 55.17 |
| " Pentasulphide | $KS_5$ | 119.00 | K 32.77 S 67.23 |
| Silver, Sulphide | AgS | 124.00 | Ag 87.09 S 12.91 |
| Sodium, " | NaS | 39.00 | Na 58.97 S 41.03 |
| " Tersulphide | $NaS_3$ | 71.00 | Na 32.39 S 67.61 |
| " Pentasulphide | $NaS_5$ | 103.00 | Na 22.33 S 77.67 |
| Tin, Sulphide | SnS | 74.00 | Sn 78.38 S 21.62 |
| " Bisulphide | $SnS_2$ | 90.00 | Sn 64.44 S 35.56 |
| Zinc, Sulphide | ZnS | 48.50 | Zn 67.01 S 32.99 |

**Acetates.**

$\overline{A} = C_4H_3O_3 = 51.$

| Base. | | | |
|---|---|---|---|
| Copper | $CuO, \overline{A} + HO$ | 99.75 | CuO 39.85 $\overline{A}$ 51.13 HO 9.02 |
| Lead | $PbO, \overline{A} + 3HO$ | 189.50 | PbO 58.84 $\overline{A}$ 26.91 HO 14.25 |
| Potassium | $KO, \overline{A}$ | 98.00 | KO 47.99 $\overline{A}$ 52.01 |
| Silver | $AgO, \overline{A}$ | 167.00 | Ag 69.46 $\overline{A}$ 30.54 |
| Sodium | $NaO, \overline{A} + 6HO$ | 136.00 | NaO 22.79 $\overline{A}$ 37.50 HO 39.71 |

**Borates.**

| | | | |
|---|---|---|---|
| Sodium, Bi- | $NaO, 2BoO_3$ | 101.00 | NaO 30.70 $BO_3$ 69.30 |
| " " Crystalized | $NaO, 2BoO_3 + 10HO$ | 191.00 | NaO 16.23 $BO_3$ 36.65 HO 47.12 |

| Base. | Formula. | Equivalent. | Per cent of Constituents. |
|---|---|---|---|
| | **Carbonates.** | | |
| Ammonium, Sesqui | $2NH_4O, 3CO_2$ | 118.00 | $NH_4O$ 44.07 $CO_2$ 55.93 |
| " Neutral | $NH_4O, CO_2$ | 48.00 | $NH_4O$ 54.17 $CO_2$ 45.83 |
| Barium | $BaO, CO_2$ | 98.50 | BaO 77.66 $CO_2$ 22.34 |
| Calcium | $CaO, CO_2$ | 50.00 | CaO 56.00 $CO_2$ 44.00 |
| Iron | $FeO, CO_2$ | 58.00 | FeO 62.07 $CO_2$ 37.93 |
| Magnesium | $MgO, CO_2$ | 42.00 | MgO 47.62 $CO_2$ 52.38 |
| Manganese | $MnO, CO_2$ | 57.00 | MnO 61.40 $CO_2$ 38.60 |
| Lead | $PbO, CO_2$ | 133.50 | PbO 83.52 $CO_2$ 16.48 |
| Potassium | $KO, CO_2$ | 69.00 | KO 68.12 $CO_2$ 31.88 |
| " Bi | $KO, 2CO_2 + HO$ | 100.00 | KO 47.00 $CO_2$ 44.00 HO 9.00 |
| Sodium | $NaO, CO_2$ | 53.00 | NaO 58.49 $CO_2$ 41.51 |
| " Crystal. | $NaO, CO_2 + 10HO$ | 143.00 | NaO 21.67 $CO_2$ 15.39 HO 62.94 |
| " Bi | $NaO, 2CO_2 + HO$ | 84.00 | NaO 36.90 $CO_2$ 52.38 HO 10.72 |
| Strontium | $SrO, CO_2$ | 73.75 | SrO 70.15 $CO_2$ 29.85 |
| Zinc | $ZnO, CO_2$ | 62.50 | ZnO 64.80 $CO_2$ 35.20 |
| | **Chlorates.** | | |
| Barium | $BaO, ClO_5$ | 152.00 | BaO 50.33 $ClO_5$ 49.67 |
| Potassium | $KO, ClO_5$ | 122.50 | KO 38.37 $ClO_5$ 61.63 |
| Silver | $AgO, ClO_5$ | 191.50 | AgO 60.57 $ClO_5$ 39.43 |
| Sodium | $NaO, ClO_5$ | 106.50 | NaO 29.11 $ClO_5$ 70.89 |
| | **Chromates.** | | |
| Barium | $BaO, CrO_3$ | 126.50 | BaO 60.47 $CrO_3$ 39.53 |
| Bismuth | $BiO_3, 2CrO_3$ | 332.00 | $BiO_3$ 69.88 $CrO_3$ 30.12 |

| | | | |
|---|---|---|---|
| Lead, Neutral | $PbO, CrO_3$ | 161.50 | PbO 69.04 $CrO_3$ 30.96 |
| " Basic | $2PbO, CrO_3$ | 273.00 | PbO 81.69 $CrO_3$ 18.31 |
| Mercury | $4Hg_2O, 3CrO_3$ | 982.00 | $Hg_2O$ 84.72 $CrO_3$ 15.28 |
| Potassium, Neutral | $KO, CrO_3$ | 97.00 | KO 48.45 $CrO_3$ 51.55 |
| " Acid | $KO, 2CrO_3$ | 147.00 | KO 31.96 $CrO_3$ 68.04 |
| Silver, Acid | $AgO, 2CrO_3$ | 216.00 | AgO 53.70 $CrO_3$ 46.30 |
| | **Nitrates.** | | |
| Ammonium | $NH_4O, NO_5$ | 80.00 | $NH_4O$ 32.50 $NO_5$ 67.50 |
| Barium | $BaO, NO_5$ | 130.50 | BaO 58.62 $NO_5$ 41.38 |
| Bismuth | $BiO_3, 3NO_5 + 10HO$ | 484.00 | BiO 47.94 $NO_5$ 33.47 HO 18.59 |
| Cobalt | $CoO, NO_5 + 6HO$ | 146.00 | CoO 26.02 $NO_5$ 36.99 HO 36.99 |
| Calcium | $CaO, NO_5$ | 82.00 | CaO 34.15 $NO_5$ 65.85 |
| Lead | $PbO, NO_5$ | 165.50 | PbO 67.37 $NO_5$ 32.63 |
| Magnesium | $MgO, NO_5$ | 74.00 | MgO 27.03 $NO_5$ 72.97 |
| Mercury, Sub | $Hg_2O, NO_5 + 2HO$ | 280.00 | HgO 74.29 $NO_5$ 19.28 HO 6.43 |
| Potassium | $KO, NO_5$ | 101.00 | KO 46.54 $NO_5$ 53.46 |
| Silver | $AgO, NO_5$ | 170.00 | AgO 68.23 $NO_5$ 31.77 |
| Sodium | $NaO, NO_5$ | 85.00 | NaO 36.47 $NO_5$ 63.53 |
| Strontium | $SrO, NO_5$ | 105.75 | SrO 48.93 $NO_5$ 51.07 |
| | **Oxalates.** | | |
| | $\overline{O} = C_2O_3 = 36.$ | | |
| Calcium | $CaO, \overline{O} + HO$ | 73.00 | CaO 38.35 $\overline{O}$ 49.32 HO 12.33 |
| Potassium | $KO, \overline{O} + HO$ | 92.00 | KO 51.09 $\overline{O}$ 39.12 HO 9.79 |
| " Bin | $KO, 2\overline{O} + 3HO$ | 146.00 | KO 32.19 $\overline{O}$ 49.31 HO 18.50 |
| " Per | $KO, 4\overline{O} + 7HO$ | 254.00 | KO 18.51 $\overline{O}$ 56.69 KO 24.80 |

| Base. | Formula. | Equivalent. | Per cent of Constituents. |
|---|---|---|---|
| | **Phosphates.** | | |
| Ammonium | $2NH_4O, HO, PO_5$ | 132.00 | $NH_4O$ 39.39 HO 6.82 $PO_5$ 53.79 |
| " and Magnesium | $NH_4O, 2MgO, PO_5 + 12HO$ | 245.00 | $NH_4O$ 10.61 MgO 16.33 $PO_5$ 28.98 HO 44.08 |
| Calcium | $3CaO, PO_5$ | 155.00 | CaO 54.19 $PO_5$ 45.81 |
| Iron | $Fe_2O_3, PO_5$ | 151.00 | $Fe_2O_3$ 52.98 $PO_5$ 47.02 |
| Magnesium, Pyro | $2MgO, PO_5$ | 111.00 | MgO 36.04 $PO_5$ 63.96 |
| Manganese, " | $2MnO, PO_5$ | 141.00 | MnO 49.65 $PO_5$ 50.35 |
| Sodium | $2NaO, HO, PO_5 + 24HO$ | 358.00 | NaO 17.32 $PO_5$ 19.83 HO 62.85 |
| Silver | $3AgO, PO_5$ | 419.00 | AgO 83.05 $PO_5$ 16.95 |
| " Pyro | $2AgO, PO_5$ | 303.00 | AgO 76.57 $PO_5$ 23.43 |
| Uranium | $U_2O_3, PO_5$ | 359.00 | $U_2O_3$ 80.22 $PO_5$ 19.78 |
| | **Sulphates.** | | |
| Aluminum | $Al_2O_3, 3SO_3 + 18HO$ | 333.50 | $Al_2O_3$ 15.44 $SO_3$ 35.98 HO 48.58 |
| Ammonium | $NH_4O, SO_3$ | 66.00 | $NH_4O$ 39.40 $SO_3$ 60.60 |
| " and Aluminum | $NH_4O, SO_3, Al_2O_3, 3SO_3 + 24HO$ | 453.50 | $NH_4O$ 5.73 $Al_2O_3$ 11.36 $SO_3$ 35.28 HO 47.63 |
| Barium | $BaO, SO_3$ | 116.50 | BaO 65.67 $SO_3$ 34.33 |
| Calcium | $CaO, SO_3$ | 68.00 | CaO 41.18 $SO_3$ 58.82 |
| " Crystal. | $CaO, SO_3 + 2HO$ | 86.00 | CaO 32.56 $SO_3$ 46.51 HO 20.93 |
| Cobalt | $CoO, SO_3$ | 78.00 | CoO 48.72 $SO_3$ 51.28 |
| " Crystal. | $CoO, SO_3 + 7HO$ | 141.00 | CoO 26.95 $SO_3$ 28.37 HO 44.68 |
| Copper | $CuO, SO_3$ | 79.75 | CuO 49.84 $SO_3$ 50.16 |
| " Crystal. | $CuO, SO_3 + 5HO$ | 124.75 | CuO 31.86 $SO_3$ 32.07 HO 36.07 |

| | | | |
|---|---|---|---|
| Iron | $FeO, SO_3$ | 76.00 | FeO 47.37 $SO_3$ 52.63 |
| " Crystal. | $FeO, SO_3 + 7HO$ | 139.00 | FeO 25.89 $SO_3$ 28.77 HO 45.34 |
| Magnesium | $MgO, SO_3$ | 60.00 | MgO 33.33 $SO_3$ 66.67 |
| " Crystal. | $MgO, SO_3 + 7HO$ | 123.00 | MgO 16.26 $SO_3$ 32.52 HO 51.22 |
| Manganese | $MnO, SO_3$ | 75.00 | MnO 46.67 $SO_3$ 53.33 |
| Nickel, Crystal. | $NiO, SO_3 + 7HO$ | 140.00 | NiO 26.43 $SO_3$ 28.57 HO 45.00 |
| Potassium | $KO, SO_3$ | 87.00 | KO 54.02 $SO_3$ 45.98 |
| " Bi | $KO, 2SO_3$ | 127.00 | KO 37.00 $SO_3$ 63.00 |
| " and Aluminum | $KO, SO_3, Al_2O_3\ 3SO_3 + 24HO$ | 474.50 | KO 9.90 $Al_2O_3$ 10.86<br>$SO_3$ 33.71 HO 45.52 |
| Lead | $PbO, SO_3$ | 151.50 | PbO 73.60 $SO_3$ 26.40 |
| Sodium | $NaO, SO_3$ | 71.00 | NaO 43.66 $SO_3$ 56.34 |
| " Crystal. | $NaO, SO_3 + 10HO$ | 161 00 | NaO 19.25 $SO_3$ 24.85 HO 55.90 |
| Silver | $AgO, SO_3$ | 156.00 | AgO 74.36 $SO_3$ 25.64 |
| Strontium | $SrO, SO_3$ | 91.75 | SrO 56.40 $SO_3$ 43.60 |
| Zinc | $ZnO, SO_3$ | 80.50 | ZnO 50.31 $SO_3$ 49.69 |
| " Crystal. | $ZnO, SO + 7HO$ | 143.50 | ZnO 28.22 $SO_3$ 27.88 HO 43.90 |

**Tartrates.**

$\overline{T} = C_8H_4O_{10} = 132.$

| | | | |
|---|---|---|---|
| Calcium | $2CaO, \overline{T} + 8HO$ | 260.00 | CaO 21.54 $\overline{T}$ 50.77 HO 27.69 |
| Potassium | $2KO, \overline{T} + HO$ | 235.00 | KO 40.00 $\overline{T}$ 56.17 HO 3.83 |
| " Acid | $KO, HO, \overline{T}$ | 188.00 | KO 25.00 $\overline{T}$ 70.21 HO 4.79 |
| " and Sodium | $KO, NaO, \overline{T} + 8HO$ | 282.00 | KO 16.66 NaO 10.99<br>$\overline{T}$ 46.81 HO 25.54 |
| " " Antimony | $KO, SbO_3, \overline{T} + HO$ | 332.00 | $SbO_3$ 43.37 KO 14.16<br>$\overline{T}$ 39.76 HO 2.71 |

# TABLE

## OF FACTORS FOR THE REDUCTION OF THE SUBSTANCE FOUND IN ANALYSIS TO THE ONE SOUGHT.

*The weight found multiplied by the factor gives the weight of the substance sought.*

### FRESENIUS'S ANALYSIS.

| Element. | Found. | Sought. | Factor. |
|---|---|---|---|
| Aluminum | $Al_2O_3$ | $Al_2$ | 0.5340 |
| Ammonium | $NH_4Cl$ | $NH_3$ | 0.3178 |
| | $NH_4Cl$ | $NH_4$ | 0.3365 |
| | $NH_4Cl, PtCl_2$ | $NH_3$ | 0.0760 |
| | $NH_4Cl, PtCl_2$ | $NH_4O$ | 0.1163 |
| Antimony | $SbO_3$ | Sb | 0.8335 |
| | $SbS_3$ | Sb | 0.7143 |
| | $SbO_4$ | Sb | 0.7896 |
| | $SbO_4$ | $SbO_3$ | 0.9474 |
| Arsenic | $AsO_3$ | As | 0.7576 |
| | $AsO_5$ | As | 0.6522 |
| | $AsO_5$ | $AsO_3$ | 0.8609 |
| | $AsS_3$ | As | 0.6098 |
| | $AsS_3$ | $AsO_3$ | 0.8049 |
| | $AsS_3$ | $AsO_5$ | 0.9349 |
| | $2MgO, NH_4O, AsO_5 + HO$ | $AsO_5$ | 0.6053 |
| | $2MgO, NH_4O, AsO_5 + HO$ | $AsO_3$ | 0.5211 |
| Barium | BaO | Ba | 0.8955 |
| | $BaO, SO_3$ | BaO | 0.6567 |
| | $BaFl, SiFl_2$ | BaO | 0.5484 |
| Bismuth | $BiO_3$ | Bi | 0.8965 |
| Boron | $BO_3$ | B | 0.3143 |
| Bromine | AgBr | Br | 0.4255 |
| Cadmium | CdO | Cd | 0.8750 |
| Cæsium | CsCl | Cs | 0.7893 |
| | $CsO, SO_3$ | CsO | 0.7790 |
| Calcium | CaO | Ca | 0.7143 |
| | $CaO, SO_3$ | CaO | 0.4118 |
| | $CaO, CO_2$ | CaO | 0.5600 |
| Carbon | $CO_2$ | C | 0.2727 |
| | $CaO, CO_2$ | $CO_2$ | 0.4400 |
| Cerium | $Ce_3O_4$ | Ce | 0.8118 |
| Chlorine | AgCl | Cl | 0.2474 |
| | AgCl | HCl | 0.2537 |
| Chromium | $Cr_2O_3$ | Cr | 0.6842 |

| Element. | Found. | Sought. | Factor. |
|---|---|---|---|
| Chromium | $Cr_2O_3$ | $CrO_3$ | 0.6579 |
| | $PbO, CrO_3$ | $CrO_3$ | 0.3096 |
| Cobalt | Co | CoO | 1.2667 |
| | $CoO, SO_3$ | CoO | 0.4872 |
| Copper | CuO | Cu | 0.7987 |
| | $Cu_2S$ | Cu | 0.7987 |
| Didymium | DO | D | 0.8571 |
| Erbium | ErO | Er | 0.8756 |
| Fluorine | CaF | F | 0.4872 |
| | $SiF_2$ | F | 0.7308 |
| Glucinum | GO | G | 0.3681 |
| Hydrogen | HO | H | 0.1111 |
| Indium | InS | In | 0.6981 |
| Iodine | AgI | I | 0.5404 |
| | PdI | I | 0.7042 |
| Iron | $Fe_2O_3$ | Fe | 0.7000 |
| | $Fe_2O_3$ | FeO | 0.9000 |
| Lanthanum | LaO | La | 0.8545 |
| Lead | PbO | Pb | 0.9283 |
| | $PbO, SO_3$ | Pb | 0.6832 |
| | PbCl | Pb | 0.7446 |
| | PbS | Pb | 0.8661 |
| Lithium | $3LO, PO_5$ | LO | 0.3879 |
| | LCl | L | 0.1647 |
| Magnesium | MgO | Mg | 0.6000 |
| | $MgO, SO_3$ | MgO | 0.3333 |
| | $2MgO, PO_5$ | MgO | 0.3604 |
| Manganese | MnO | Mn | 0.7714 |
| | $Mn_2O_3$ | MnO | 0.8973 |
| | $Mn_3O_4$ | MnO | 0.9292 |
| | $MnO, SO_3$ | MnO | 0.4667 |
| | $2MnO, PO_5$ | MnO | 0.4965 |
| Mercury | Hg | $Hg_2O$ | 1.0400 |
| | Hg | HgO | 1.0800 |
| | $Hg_2Cl$ | Hg | 0.8492 |
| | HgS | Hg | 0.8621 |
| Molybdenum | $MoO_3$ | Mo | 0.6571 |
| Nickel | NiO | Ni | 0.7838 |
| Niobium | $NbO_5$ | Nb | 0.7015 |
| Nitrogen | $NH_4Cl, PtCl_2$ | N | 0.0627 |
| | Pt | N | 0.1414 |
| | $AgC_2N$ | $C_2N$ | 0.1941 |
| | $AgC_2N$ | $HC_2N$ | 0.2015 |
| Oxygen | $Al_2O_3$ | O | 0.4660 |
| | $SbO_3$ | O | 0.1665 |
| | $AsO_3$ | O | 0.2424 |
| | $AsO_5$ | O | 0.3478 |

| Element. | Found. | Sought. | Factor. |
|---|---|---|---|
| Oxygen | $BaO$ | O | 0.1045 |
| | $BiO_2$ | O | 0.1035 |
| | $CdO$ | O | 0.1250 |
| | $CaO$ | O | 0.2857 |
| | $Cr_2O_3$ | O | 0.3158 |
| | $CuO$ | O | 0.2012 |
| | $HO$ | O | 0.8889 |
| | $Fe_2O_3$ | O | 0.3000 |
| | $FeO$ | O | 0.2222 |
| | $PbO$ | O | 0.0717 |
| | $MgO$ | O | 0.4000 |
| | $MnO$ | O | 0.2286 |
| | $Mn_3O_4$ | O | 0.2832 |
| | $Mn_2O_3$ | O | 0.3077 |
| | $MnO_2$ | O | 0.3721 |
| | $MnO_3$ | O | 0.4706 |
| | $Mn_2O_7$ | O | 0.5091 |
| | $HgO$ | O | 0.0741 |
| | $Hg_2O$ | O | 0.0385 |
| | $KO$ | O | 0.1706 |
| | $SiO_2$ | O | 0.5333 |
| | $AgO$ | O | 0.0690 |
| | $NaO$ | O | 0.2581 |
| | $SrO$ | O | 0.1546 |
| | $SnO$ | O | 0.2162 |
| | $ZnO$ | O | 0.1976 |
| Potassium | $KO$ | K | 0.8294 |
| | $KO, SO_3$ | KO | 0.5402 |
| | $KO, NO_5$ | KO | 0.4654 |
| | $KCl$ | KO | 0.6309 |
| | $KCl$ | K | 0.6235 |
| | $KCl, PtCl_2$ | KO | 0.1922 |
| | $KCl, PtCl_2$ | KCl | 0.3047 |
| Rubidium | $RbCl$ | RbO | 0.7725 |
| | $RbO$ | Rb | 0.9143 |
| Silicon | $SiO_2$ | Si | 0.4667 |
| Silver | $AgCl$ | Ag | 0.7526 |
| | $AgCl$ | AgO | 0.8084 |
| Sodium | $NaO$ | Na | 0.7419 |
| | $NaO, SO_3$ | NaO | 0.4366 |
| | $NaO, NO_5$ | NaO | 0.3647 |
| | $NaCl$ | NaO | 0.5299 |
| | $NaCl$ | Na | 0.3922 |
| | $NaO, CO_2$ | NaO | 0.5849 |
| Strontium | $SrO$ | Sr | 0.8454 |
| | $SrO, SO_3$ | SrO | 0.5640 |
| | $SrO, CO_2$ | SrO | 0.7015 |

| Element. | Found. | Sought. | Factor. |
|---|---|---|---|
| Sulphur | $BaO, SO_3$ | S | 0.1372 |
| | $BaO, SO_3$ | $SO_3$ | 0.3433 |
| | $AsS_3$ | S | 0.3902 |
| Tantalum | $TaO_5$ | Ta | 0.8113 |
| Thallium | TlS | Tl | 0.9272 |
| " | TlI | Tl | 0.6163 |
| Thorium | $ThO_2$ | Th | 0.8788 |
| Tin | $SnO_2$ | Sn | 0.7838 |
| | $SnO_2$ | SnO | 0.8919 |
| Titanium | $TiO_2$ | Ti | 0.6098 |
| Tungsten | $WO_3$ | W | 0.7143 |
| Yttrium | YO | Y | 0.7941 |
| Zinc | ZnO | Zn | 0.8024 |
| Zirconium | $ZrO_2$ | Zr | 0.8485 |

## FORMULAS FOR INDIRECT ESTIMATION.

### 1. *Estimation of Sulphates of Potassium and Sodium.*

$N = 9.65158\,A - 4.43751\,S$

$K = S - N$

S = weight of both Sulphates
K = weight of $KO, SO_3$
N = weight of $NaO, SO_3$
A = weight of $SO_3$.

### 2. *Estimation of Potassium and Sodium from the Chlorides.*

$K = 2.4375\,S - 4.01672\,A$

$N = S - (A + K)$

S = weight of both Chlorides
A = weight of Chlorine
N = weight of Sodium
K = weight of Potassium.

### 3. *Carbonates of Lime and Strontia.*

$Ca = 7.0574\,A - 2.10526\,S$

$Sr = S - Ca$

S = weight of both Carbonates
A = weight of Carbonic Acid
Ca = weight of Carbonate of Lime
Sr = weight of Carbonate of Strontia.

# TABLE OF FACTORS.

## FOR SODA, POTASSA, AND BINOXIDE OF MANGANESE.

*The weight of the substance found multiplied by the factor gives the weight of the substance sought.*

| Found. | Sought. | Factor. |
|---|---|---|
| | **Soda.** | |
| $CO_2$ | NaO | 1.4091 |
| " | NaO, HO | 1.8182 |
| " | NaO, $CO_2$ | 2.4091 |
| " | NaO, $CO_2$ + 10HO | 6.5000 |
| NaO | NaO, HO | 1.2903 |
| " | NaO, $CO_2$ | 1.7097 |
| " | NaO, $CO_2$ + 10HO | 4.6129 |
| | **Potassa.** | |
| $CO_2$ | KO | 2.1363 |
| " | KO, HO | 2.5450 |
| " | KO, $CO_2$ | 3.1363 |
| KO | KO, HO | 1.1915 |
| " | KO, $CO_2$ | 1.4681 |
| | **Manganese.** | |
| $CO_2$ | $MnO_2$ | 0.9773 |

# TABLE

*Giving the corresponding per cents of Chlorine and Binoxide of Manganese, from the amount of Sulphate of Iron Peroxidized, when 5 grammes of Black Oxide of Manganese and 31.9 grammes of Sulphate of Iron are taken for testing.*

OTTO'S LEHRBUCH.

| Decigrammes remaining of Sulphate of Iron. | Decigrammes used of Sulphate of Iron. | Per cent of Binoxide contained in the Manganese. | Per cent of Chlorine liberated by the Manganese. | Decigrammes remaining of Sulphate of Iron. | Decigrammes used of Sulphate of Iron. | Per cent of Binoxide contained in the Manganese. | Per cent of Chlorine liberated by the Manganese. |
|---|---|---|---|---|---|---|---|
| 0 | 319 | 100 | 81.3 | 98 | 221 | 69 | 56.3 |
| 3 | 316 | 99 | 80.6 | 102 | 217 | 68 | 55.3 |
| 6 | 313 | 98 | 79.8 | 105 | 214 | 67 | 54.5 |
| 9 | 310 | 97 | 79.0 | 108 | 211 | 66 | 53.8 |
| 12 | 307 | 96 | 78.2 | 111 | 208 | 65 | 53.0 |
| 15 | 304 | 95 | 77.4 | 115 | 204 | 64 | 52.0 |
| 18 | 301 | 94 | 76.5 | 118 | 201 | 63 | 51.2 |
| 22 | 297 | 63 | 75.7 | 121 | 198 | 62 | 50.5 |
| 25 | 294 | 92 | 75.0 | 124 | 195 | 61 | 49.7 |
| 28 | 291 | 91 | 74.3 | 127 | 192 | 60 | 48.9 |
| 31 | 288 | 90 | 73.5 | 130 | 189 | 59 | 48.2 |
| 34 | 285 | 89 | 72.7 | 134 | 185 | 58 | 47.2 |
| 38 | 281 | 88 | 71.6 | 137 | 182 | 57 | 46.4 |
| 41 | 278 | 87 | 70.9 | 140 | 179 | 56 | 45.6 |
| 44 | 275 | 86 | 70.1 | 143 | 176 | 55 | 44.9 |
| 47 | 272 | 85 | 69.3 | 147 | 172 | 54 | 43.8 |
| 50 | 269 | 84 | 68.6 | 150 | 169 | 53 | 43.1 |
| 53 | 266 | 83 | 67.8 | 153 | 166 | 52 | 42.3 |
| 57 | 262 | 82 | 66.8 | 156 | 163 | 51 | 41.5 |
| 60 | 259 | 81 | 66.0 | 159 | 160 | 50 | 40.8 |
| 63 | 256 | 80 | 65.3 | 162 | 157 | 49 | 40.0 |
| 66 | 253 | 79 | 64.5 | 165 | 154 | 48 | 39.3 |
| 69 | 250 | 78 | 63.7 | 168 | 151 | 47 | 38.5 |
| 73 | 246 | 77 | 62.7 | 172 | 147 | 46 | 37.5 |
| 76 | 243 | 76 | 61.9 | 175 | 144 | 45 | 36.7 |
| 79 | 240 | 75 | 61.2 | 178 | 141 | 44 | 35.9 |
| 82 | 237 | 74 | 60.4 | 182 | 137 | 43 | 34.9 |
| 85 | 234 | 73 | 59.6 | 185 | 134 | 42 | 34.2 |
| 89 | 230 | 72 | 58.6 | 188 | 131 | 41 | 33.4 |
| 92 | 227 | 71 | 57.8 | 191 | 128 | 40 | 32.6 |
| 95 | 224 | 70 | 57.1 | | | | |

# TABLE

*Giving the per cent of Chlorine in Chloride of Lime from the number of parts it takes to Peroxidize 3.9 grammes of Sulphate of Iron, when 100 parts of the Solution contain 5 grammes of the Chloride of Lime to be tested.*

(OTTO'S LEHRBUCH.)

| Number of Parts used of the Solution of Chloride of Lime. | Per cent of Chlorine. | Number of Parts used of the Solution of Chloride of Lime. | Per cent of Chlorine. | Number of Parts used of the Solution of Chloride of Lime. | Per cent of Chlorine. |
|---|---|---|---|---|---|
| 31 | 32.2 | 55 | 18.2 | 79 | 12.7 |
| 32 | 31.2 | 56 | 17.8 | 80 | 12.5 |
| 33 | 30.3 | 57 | 17.5 | 81 | 12.3 |
| 34 | 29.4 | 58 | 17.2 | 82 | 12.2 |
| 35 | 28.6 | 59 | 17.0 | 83 | 12.0 |
| 36 | 27.8 | 60 | 16.7 | 84 | 11.9 |
| 37 | 27.0 | 61 | 16.4 | 85 | 11.7 |
| 38 | 26.3 | 62 | 16.1 | 86 | 11.6 |
| 39 | 25.6 | 63 | 15.9 | 87 | 11.5 |
| 40 | 25.0 | 64 | 15.6 | 88 | 11.3 |
| 41 | 24.4 | 65 | 15.4 | 89 | 11.2 |
| 42 | 23.8 | 66 | 15.1 | 90 | 11.1 |
| 43 | 23.3 | 67 | 14.9 | 91 | 10.9 |
| 44 | 22.7 | 68 | 14.7 | 92 | 10.8 |
| 45 | 22.2 | 69 | 14.5 | 93 | 10.7 |
| 46 | 21.7 | 70 | 14.3 | 94 | 10.6 |
| 47 | 21.3 | 71 | 14.1 | 95 | 10.5 |
| 48 | 20.8 | 72 | 13.9 | 96 | 10.4 |
| 49 | 20.4 | 73 | 13.7 | 97 | 10.3 |
| 50 | 20.0 | 74 | 13.5 | 98 | 10.2 |
| 51 | 19.6 | 75 | 13.3 | 99 | 10.1 |
| 52 | 19.2 | 76 | 13.1 | 100 | 10.0 |
| 53 | 18.8 | 77 | 13.0 | | |
| 54 | 18.5 | 78 | 12.8 | | |

# TABLES

RELATING TO

# SPECIFIC GRAVITY.

# SPECIFIC GRAVITIES OF THE ELEMENTS.

| Element. | Specific Gravity. | Element. | Specific Gravity. |
|---|---|---|---|
| **Solids and Liquids.** Water = 1 at 0° C., 760 m. Barom. | | Palladium | 11–12 |
| | | Phosphorus { Amorphous | 2.089 |
| | | Phosphorus { Crystallized | 1.826 |
| Aluminum | 2.670 | Platinum | 20.8–21.74 |
| Antimony | 6.720 | Potassium | 0.865 |
| Arsenic | 5.630 | Rhodium | 11.000 |
| Barium | 1.850 | Rubidium | 1.520 |
| Bismuth | 9.780 | Ruthenium | 11–12 |
| Boron | 2.680 | Selenium { Amorphous | 4.250 |
| Bromine | 3.187 | Selenium { Crystallized | 4.800 |
| Cadmium | 8.604 | Silicon | 2.490 |
| Calcium | 1.578 | Silver | 10.570 |
| Carbon { Diamond | 3.500 | Sodium | 0.972 |
| Carbon { Graphite | 2.200 | Strontium | 2.540 |
| Carbon { Coal of Sugar | 2.000 | Sulphur { Rhombic | 2.070 |
| Chromium | 6.810 | Sulphur { Monoclinic | 1.958 |
| Cobalt | 8.950 | Sulphur { Amorphous | 1.919 |
| Copper | 8.8–9 | Tantalum | 10.780 |
| Glucinum | 2.100 | Tellurium | 6.650 |
| Gold | 19.340 | Thallium | 11.862 |
| Indium | 7.200 | Tin | 7.300 |
| Iodine | 4.950 | Tungsten | 17.500 |
| Iridium | 21.800 | Uranium | 18.400 |
| Iron | 7.840 | Vanadium | 3.640 |
| Lead | 11.330 | Zinc | 7.200 |
| Lithium | 0.593 | **Gases.** | |
| Magnesium | 1.750 | Air = 1 at 0° C., 760 m. Barom. | |
| Manganese | 8.000 | | |
| Mercury | 13.596 | Chlorine | 2.47000 |
| Molybdenum | 8.640 | Hydrogen | 0.06926 |
| Nickel | 8.900 | Nitrogen | 0.97137 |
| Osmium | 21.400 | Oxygen | 1.10563 |

# TABLE

## OF THE SPECIFIC GRAVITIES OF THE MOST FREQUENTLY OCCURRING COMBINATIONS.

BOEDEKER. — Supplement zu den Lehrbüchern der Chemie und Mineralogie.

| Name. | Formula. | Specific Gravity. |
|---|---|---|
| **Bromides.** | | |
| Ammonium, Bromide | $NH_4Br$ | 2.266 |
| Barium " | BaBr | 4.280 |
| " " Crystal. | BaBr + 2HO | 3.690 |
| Mercury " | HgBr | 5.920 |
| " " Sub | $Hg_2Br$ | 7.307 |
| Potassium " | KBr | 2.415 |
| Silver " | AgBr | 6.278 |
| Sodium " | NaBr | 3.079 |
| **Chlorides.** | | |
| Ammonium, Chloride | $NH_4Cl$ | 1.500 |
| Barium " | BaCl | 3.800 |
| " " Crystal. | BaCl + 2HO | 3.050 |
| Calcium " | CaCl | 2.205 |
| " " Crystal. | CaCl + 6HO | 1.612 |
| Copper " | $Cu_2Cl$ | 3.680 |
| Iron " | FeCl | 2.528 |
| Lead " | PbCl | 5.540 |
| Lithium " | LCl | 1.998 |
| Manganese " | MnCl + 4HO | 2.0146 |
| Mercury " | HgCl | 5.420 |
| " " Sub | $Hg_2Cl$ | 6.990 |
| Nickel " | NiCl | 2.560 |
| Potassium " | KCl | 1.950 |
| Silver " | AgCl | 5.500 |
| Sodium " | NaCl | 2.160 |
| Strontium " | SrCl | 2.960 |
| Tin " | SnCl + 2HO | 2.293 |
| **Iodides.** | | |
| Barium, Iodide | BaI | 4.917 |
| Copper " | CuI | 4.410 |
| Lead " | PbI | 6.384 |

| Name. | Formula. | Specific Gravity. |
|---|---|---|
| Mercury, Iodide | $HgI$ | 6.257 |
| " " Sub | $Hg_2I$ | 7.750 |
| Potassium " | $KI$ | 3.056 |
| Silver " | $AgI$ | 5.614 |
| Sodium " | $NaI$ | 3.450 |
| | **Oxides.** | |
| Aluminum, Oxide | $Al_2O_3$ | 4.000 |
| Antimonic Acid | $SbO_5$ | 6.525 |
| Antimonous Acid | $SbO_4$ | 6.695 |
| Antimony, Oxide | $SbO_3$ | 5.566 |
| Arsenous Acid | $AsO_3$ | 3.884 |
| Arsenic " | $AsO_5$ | 3.734 |
| Barium, Oxide | $BaO$ | 5.456–4.732 |
| " " Crystal. | $BaO + 9HO$ | 1.656 |
| " Hydrate | $BaO, HO$ | 4.495 |
| Boric Acid | $BO_3$ | 1.830 |
| " " Crystal. | $BO_3 + 3HO$ | 1.479 |
| Bismuth, Oxide | $BiO_3$ | 8.968 |
| Cadmium " | $CdO$ | 8.110 |
| Calcium " | $CaO$ | 3.180 |
| Chromium " | $Cr_2O_3$ | 5.210 |
| Cobalt " | $Co_2O_3$ | 5.600 |
| Copper " | $CuO$ | 6.430 |
| " " Sub | $Cu_2O$ | 5.751 |
| Iron, Protosesquioxide | $Fe_3O_4$ | 5.185 |
| " Sesquioxide | $Fe_2O_3$ | 5.224 |
| " Hydrate | $Fe_2O_3, HO$ | 3.7–3.9 |
| Lead, Oxide | $PbO$ | 9.360 |
| " " Per | $PbO_2$ | 9.300 |
| Magnesium, Oxide | $MgO$ | 3.200 |
| Manganese " | $MnO$ | 4.720 |
| " " Sesqui | $Mn_2O_3$ | 4.820 |
| " " Per | $MnO_2$ | 4.900 |
| " " Hydrate | $Mn_2O_3, HO$ | 4.328 |
| Mercury, Oxide | $HgO$ | 11.290 |
| " " Sub | $Hg_2O$ | 8.950 |
| Molybdenum, Oxide | $MoO_2$ | 5.606 |
| " Acid | $MoO_3$ | 3.460 |
| Nickel, Oxide | $NiO$ | 6.660 |
| " " Sesqui | $Ni_2O_3$ | 4.840 |
| Potassium, Oxide | $KO$ | 2.656 |
| " Hydrate | $KO, HO$ | 2.100 |
| Silicic Acid | $SiO_3$ | 2.660 |
| Sodium, Oxide | $NaO$ | 2.805 |
| " Hydrate | $NaO, HO$ | 2.000 |

| Name. | Formula. | Specific Gravity. |
|---|---|---|
| Strontium, Oxide | SrO | 4.611 |
| " " Crystal. | SrO + 9HO | 1.396 |
| Sulphuric Acid | $SO_3$ | 1.970 (20°) |
| Tin, Oxide | SnO | 6.666 |
| " " Bin | $SnO_2$ | 6.720–6.950 |
| Titanic Acid (Anatase) | $TiO_2$ | 3.840 |
| Titanic Acid (Brookite) | $TiO_2$ | 4.130 |
| Titanic Acid (Rutile) | $TiO_2$ | 4.250 |
| Tungstic Acid | $WO_3$ | 7.1369 |
| Uranium, Oxide | UO | 10.150 |
| Uranium Protosesquioxide | $U_3O_4$ | 7.310 |
| Vanadic Acid | $VO_3$ | 3.510 |
| Zinc, Oxide | ZnO | 5.630 |
| **Sulphides.** | | |
| Antimony, Tersulphide | $SbS_3$ | 4.752 |
| Arsenic " | $AsS_3$ | 3.480 |
| " Bisulphide | $AsS_2$ | 3.544 |
| Bismuth, Sulphide | $BiS_3$ | 7.000 |
| Cadmium " | CdS | 4.900 |
| Cobalt " | $Co_2S_3$ | 4.800 |
| Copper " | CuS | 4.163 |
| " " Sub | $Cu_2S$ | 5.500 |
| Iron " Bi | $FeS_2$ | 4.65–5.1 |
| " " | FeS | 4.400 |
| Lead " | PbS | 6.924 |
| Manganese " | MnS | 4.000 |
| " " Bi | $MnS_2$ | 3.463 |
| Mercury " | HgS | 8.124 |
| Molybdenum " | $MoS_2$ | 4.690 |
| Nickel " | NiS | 5.650 |
| Potassium " | KS | 2.130 |
| Silver " | AgS | 6.850 |
| Sodium " | NaS | 2.471 |
| Tin " | SnS | 4.973 |
| " " Bi | $SnS_2$ | 4.600 |
| Zinc " | ZnS | 3.920 |
| **Borates.** | | |
| Borax | $NaO, 2BO_3 + 10HO$ | 1.740 |
| " Anhydrous | $NaO, 2BO_3$ | 2.600 |

| Name. | Formula. | Specific Gravity. |
|---|---|---|
| **Carbonates.** | | |
| Ammonium, Carbonate | $2NH_4O, 3CO_2$ | 1.450 |
| Barium " | $BaO, CO_2$ | 4.300 |
| Calcium " Arragonite | $CaO, CO_2$ | 2.900 |
| " " Calc-spar | $CaO, CO_2$ | 2.720 |
| Iron " | $FeO, CO_2$ | 3.870 |
| Lead " | $PbO, CO_2$ | 6.400 |
| Lithium " | $LO, CO_2$ | 2.110 |
| Magnesium " | $MgO, CO_2$ | 2.990 |
| Manganese " | $MnO, CO_2$ | 3.55–3.95 |
| Potassium " | $KO, CO_2$ | 2.267 |
| Sodium " | $NaO, CO_2$ | 2.509 |
| " " Crystal. | $NaO, CO_2 + 10HO$ | 1.454 |
| Strontium " | $SrO, CO_2$ | 3.600 |
| Zinc " | $ZnO, CO_2$ | 4.1–4.5 |
| **Chlorates.** | | |
| Barium, Chlorate | $BaO, ClO_5$ | 2.988 |
| Potassium " | $KO, ClO_5$ | 2.350 |
| Sodium " | $NaO, ClO_5$ | 2.289 |
| Silver " | $AgO, ClO_5$ | 4.430 |
| **Chromates.** | | |
| Ammonium, Chromate, Bi | $NH_4O, 2CrO_3$ | 2.367 |
| Lead " | $PbO, CrO_3$ | 6.100 |
| Potassium " | $KO, CrO_3$ | 2.640 |
| " " Bi | $KO, 2CrO_3$ | 2.603 |
| **Nitrates.** | | |
| Ammonium, Nitrate | $NH_4O, NO_5$ | 1.740 |
| Barium " | $BaO, NO_5$ | 3.200 |
| Calcium " | $CaO, NO_5$ | 2.240 |
| Lead " | $PbO, NO_5$ | 4.470 |
| Lithium " | $LO, NO_5$ | 2.334 |
| Potassium " | $KO, NO_5$ | 2.058 |
| Silver " | $AgO, NO_5$ | 4.355 |
| Strontium " | $SrO, NO_5$ | 2.810 |
| Sodium " | $NaO, NO_5$ | 2.200 |
| **Oxalates.** | | |
| Ammonium, Oxalate | $NH_4O, \overline{O} + 2HO$ | 1.500 |
| Potassium " | $KO, \overline{O} + HO$ | 2.120 |
| " " Acid | $KO, HO, 2\overline{O} + 2HO$ | 2.044 |

| Name. | Formula. | Specific Gravity. |
|---|---|---|
| **Phosphates.** | | |
| Lead, Phosphate | $3PbO, PO_5$ | 7.208 |
| Sodium " | $2NaO, HO, PO_5 + 24HO$ | 1.525 |
| " " Pyro | $2NaO, PO_5 + 10HO$ | 1.836 |
| Silver " | $3AgO, PO_5$ | 5.306 |
| " " Pyro | $2AgO, PO_5$ | 7.300 |
| **Sulphates.** | | |
| Ammonium, Sulphate | $NH_4O, SO_3$ | 1.760 |
| Barium " | $BaO, SO_3$ | 4.500 |
| Calcium " | $CaO, SO_3$ | 2.960 |
| " " Crystal. | $CaO, SO_3 + 2HO$ | 2.330 |
| Cobalt " " | $CoO, SO_3 + 7HO$ | 1.924 |
| Copper " | $CuO, SO_3$ | 3.572 |
| " " Crystal. | $CuO, SO_3 + 5HO$ | 2.300 |
| Iron " | $FeO, SO_3$ | 2.840 |
| " " Crystal. | $FeO, SO_3 + 7HO$ | 1.8–1.9 |
| Lead " | $PbO, SO_3$ | 6.300 |
| Lithium, Sulphate | $LO, SO_3$ | 2.210 |
| " " Crystal. | $LO, SO_3 + HO$ | 2.020 |
| Magnesia " | $MgO, SO_3$ | 2.600 |
| " " Crystal. | $MgO, SO_3 + 7HO$ | 1.750 |
| Manganese " | $MnO, SO_3$ | 3.100 |
| " " Crystal. | $MnO, SO_3 + 4HO$ | 2.090 |
| Nickel " " | $NiO, SO_3 + 7HO$ | 2.040 |
| Potassium " | $KO, SO_3$ | 2.660 |
| " " Acid | $KO, 2SO_3$ | 2.277 |
| Potassa, Alum | $KO, SO_3, Al_2O_3, 3SO_3 + 24HO$ | 1.724 |
| Silver, Sulphate | $AgO, SO_3$ | 5.400 |
| Sodium " | $NaO, SO_3$ | 2.460 |
| " " Crystal. | $NaO, SO_3 + 10HO$ | 1.500 |
| Soda, Alum | $NaO, SO_3, Al_2O_3, 3SO_3 + 24HO$ | 1.880 |
| Strontium, Sulphate | $SrO, SO_3$ | 3.925 |
| Zinc " | $ZnO, SO_3$ | 3.400 |
| " Crystal. | $ZnO, SO_3 + 7HO$ | 1.9–2.1 |

# TABLE

## OF THE PER CENT OF DRY AMMONIA GAS IN A SOLUTION AT 14° C.

CARIUS. — Ann. Ch. u. Pharm. 1856, 99, pp. 163, 164.

| Specific Gravity. | Per cent Ammonia. | Specific Gravity. | Per cent Ammonia. | Specific Gravity. | Per cent Ammonia. | Specific Gravity. | Per cent Ammonia. |
|---|---|---|---|---|---|---|---|
| 0.8844 | 36 | 0.9052 | 27 | 0.9314 | 18 | 0.9631 | 9 |
| 0.8864 | 35 | 0.9078 | 26 | 0.9347 | 17 | 0.9670 | 8 |
| 0.8885 | 34 | 0.9106 | 25 | 0.9380 | 16 | 0.9709 | 7 |
| 0.8907 | 33 | 0.9133 | 24 | 0.9414 | 15 | 0.9749 | 6 |
| 0.8929 | 32 | 0.9162 | 23 | 0.9449 | 14 | 0.9790 | 5 |
| 0.8953 | 31 | 0.9191 | 22 | 0.9484 | 13 | 0.9831 | 4 |
| 0.8976 | 30 | 0.9221 | 21 | 0.9520 | 12 | 0.9873 | 3 |
| 0.9001 | 29 | 0.9251 | 20 | 0.9556 | 11 | 0.9915 | 2 |
| 0.9026 | 28 | 0.9283 | 19 | 0.9593 | 10 | 0.9959 | 1 |

# TABLE

## OF THE PER CENT OF DRY AMMONIA GAS IN A SOLUTION AT 16° C.

OTTO'S LEHRBUCH.

| Specific Gravity. | Per cent Ammonia. | Specific Gravity. | Per cent Ammonia. | Specific Gravity. | Per cent Ammonia. | Specific Gravity. | Per cent Ammonia. |
|---|---|---|---|---|---|---|---|
| 0.9517 | 12.000 | 0.9583 | 10.250 | 0.9654 | 8.375 | 0.9726 | 6.500 |
| 0.9521 | 11.875 | 0.9588 | 10.125 | 0.9659 | 8.250 | 0.9730 | 6.375 |
| 0.9526 | 11.750 | 0.9593 | 10.000 | 0.9664 | 8.125 | 0.9735 | 6.250 |
| 0.9531 | 11.625 | 0.9597 | 9.875 | 0.9669 | 8.000 | 0.9740 | 6.125 |
| 0.9536 | 11.500 | 0.9602 | 9.750 | 0.9673 | 7.875 | 0.9745 | 6.000 |
| 0.9540 | 11.375 | 0.9607 | 9.625 | 0.9678 | 7.750 | 0.9749 | 5.875 |
| 0.9545 | 11.250 | 0.9612 | 9.500 | 0.9683 | 7.625 | 0.9754 | 5.750 |
| 0.9550 | 11.125 | 0.9616 | 9.375 | 0.9688 | 7.500 | 0.9759 | 5.625 |
| 0.9555 | 11.000 | 0.9621 | 9.250 | 0.9692 | 7.375 | 0.9764 | 5.500 |
| 0.9556 | 10.950 | 0.9626 | 9.125 | 0.9697 | 7.250 | 0.9768 | 5.375 |
| 0.9559 | 10.875 | 0.9631 | 9.000 | 0.9702 | 7.125 | 0.9773 | 5.250 |
| 0.9564 | 10.750 | 0.9636 | 8.875 | 0.9707 | 7.000 | 0.9778 | 5.125 |
| 0.9569 | 10.625 | 0.9641 | 8.750 | 0.9711 | 6.875 | 0.9783 | 5.000 |
| 0.9574 | 10.500 | 0.9645 | 8.625 | 0.9716 | 6.750 | | |
| 0.9578 | 10.375 | 0.9650 | 8.500 | 0.9721 | 6.625 | | |

## TABLE

OF THE PER CENT OF POTASSA (KO) IN A SOLUTION AT 15° C.

TÜNNERMANN. — Handwörterbuch, Bd. IV. pp. 253.

| Specific Gravity. | Per cent Potassa. | Specific Gravity. | Per cent Potassa. | Specific Gravity. | Per cent Potassa. |
|---|---|---|---|---|---|
| 1.3300 | 28.290 | 1.1979 | 18.671 | 1.0819 | 8.487 |
| 1.3131 | 27.158 | 1.1839 | 17.540 | 1.0703 | 7.355 |
| 1.2966 | 26.027 | 1.1702 | 16.408 | 1.0589 | 6.224 |
| 1.2803 | 24.895 | 1.1568 | 15.277 | 1.0478 | 5.002 |
| 1.2648 | 23.764 | 1.1437 | 14.145 | 1.0369 | 3.961 |
| 1.2493 | 22.632 | 1.1308 | 13.013 | 1.0260 | 2.829 |
| 1.2342 | 21.500 | 1.1182 | 11.882 | 1.0153 | 1.697 |
| 1.2268 | 20.935 | 1.1059 | 10.750 | 1.0050 | 0.5658 |
| 1.2122 | 19.803 | 1.0938 | 9.619 | | |

## TABLE

OF THE PER CENT OF SODA (NaO) IN A SOLUTION AT 15° C.

TÜNNERMANN. — Handwörterbuch, Bd. V. pp. 522.

| Specific Gravity. | Per cent Soda. | Specific Gravity. | Per cent Soda. | Specific Gravity. | Per cent Soda. |
|---|---|---|---|---|---|
| 1.4285 | 30.220 | 1.2982 | 20.550 | 1.1528 | 10.275 |
| 1.4193 | 29.616 | 1.2912 | 19.945 | 1.1428 | 9.670 |
| 1.4101 | 29.011 | 1.2843 | 19.341 | 1.1330 | 9.066 |
| 1.4011 | 28.407 | 1.2775 | 18.730 | 1.1233 | 8.462 |
| 1.3923 | 27.802 | 1.2708 | 18.132 | 1.1137 | 7.857 |
| 1.3836 | 27.200 | 1.2642 | 17.528 | 1.1042 | 7.253 |
| 1.3751 | 26.594 | 1.2578 | 16.923 | 1.0948 | 6.648 |
| 1.3668 | 25.989 | 1.2515 | 16.319 | 1.0855 | 6.044 |
| 1.3586 | 25.385 | 1.2453 | 15.714 | 1.0764 | 5.440 |
| 1.3505 | 24.780 | 1.2392 | 15.110 | 1.0675 | 4.835 |
| 1.3426 | 24.176 | 1.2280 | 14.506 | 1.0587 | 4.231 |
| 1.3349 | 23.572 | 1.2178 | 13.901 | 1.0500 | 3.626 |
| 1.3273 | 22.967 | 1.2058 | 13.297 | 1.0414 | 3.022 |
| 1.3198 | 22.363 | 1.1948 | 12.692 | 1.0330 | 2.418 |
| 1.3143 | 21.894 | 1.1841 | 12.088 | 1.0246 | 1.813 |
| 1.3125 | 21.758 | 1.1734 | 11.484 | 1.0163 | 1.209 |
| 1.3053 | 21.154 | 1.1630 | 10.879 | 1.0081 | 0.604 |

# TABLE

## OF THE SPECIFIC GRAVITY OF SULPHURIC ACID.

*Calculated by Otto from Bineau's data for the Temperature of* 15° *C.*

| Specific Gravity. | Hydrated Acid. | $SO_3$ | Specific Gravity. | Hydrated Acid. | $SO_3$ | Specific Gravity. | Hydrated Acid. | $SO_3$ |
|---|---|---|---|---|---|---|---|---|
| 1.8426 | 100 | 81.63 | 1.5780 | 66 | 53.87 | 1.2390 | 32 | 26.12 |
| 1.8420 | 99 | 80.81 | 1.5570 | 65 | 53.05 | 1.2310 | 31 | 25.30 |
| 1.8406 | 98 | 80.00 | 1.5450 | 64 | 52.24 | 1.2230 | 30 | 24.49 |
| 1.8400 | 97 | 79.18 | 1.5340 | 63 | 51.42 | 1.2150 | 29 | 23.67 |
| 1.8384 | 96 | 78.36 | 1.5230 | 62 | 50.61 | 1.2066 | 28 | 22.85 |
| 1.8376 | 95 | 77.55 | 1.5120 | 61 | 49.79 | 1.1980 | 27 | 22.03 |
| 1.8356 | 94 | 76.73 | 1.5010 | 60 | 48.98 | 1.1900 | 26 | 21.22 |
| 1.8340 | 93 | 75.91 | 1.4900 | 59 | 48.16 | 1.1820 | 25 | 20.40 |
| 1.8310 | 92 | 75.10 | 1.4800 | 58 | 47.34 | 1.1740 | 24 | 19.58 |
| 1.8270 | 91 | 74.28 | 1.4690 | 57 | 46.53 | 1.1670 | 23 | 18.77 |
| 1.8220 | 90 | 73.47 | 1.4586 | 56 | 45.71 | 1.1590 | 22 | 17.95 |
| 1.8160 | 89 | 72.65 | 1.4480 | 55 | 44.89 | 1.1516 | 21 | 17.14 |
| 1.8090 | 88 | 71.83 | 1.4380 | 54 | 44.07 | 1.1440 | 20 | 16.32 |
| 1.8020 | 87 | 71.02 | 1.4280 | 53 | 43.26 | 1.1360 | 19 | 15.51 |
| 1.7940 | 86 | 70.10 | 1.4180 | 52 | 42.45 | 1.1290 | 18 | 14.69 |
| 1.7860 | 85 | 69.38 | 1.4080 | 51 | 41.63 | 1.1210 | 17 | 13.87 |
| 1.7770 | 84 | 68.57 | 1.3980 | 50 | 40.81 | 1.1136 | 16 | 13.06 |
| 1.7670 | 83 | 67.75 | 1.3886 | 49 | 40.00 | 1.1060 | 15 | 12.24 |
| 1.7560 | 82 | 66.94 | 1.3790 | 48 | 39.18 | 1.0980 | 14 | 11.42 |
| 1.7450 | 81 | 66.12 | 1.3700 | 47 | 38.36 | 1.0910 | 13 | 10.61 |
| 1.7340 | 80 | 65.30 | 1.3610 | 46 | 37.55 | 1.0830 | 12 | 9.79 |
| 1.7220 | 79 | 64.48 | 1.3510 | 45 | 36.73 | 1.0756 | 11 | 8.98 |
| 1.7100 | 78 | 63.67 | 1.3420 | 44 | 35.82 | 1.0680 | 10 | 8.16 |
| 1.6980 | 77 | 62.85 | 1.3330 | 43 | 35.10 | 1.0610 | 9 | 7.34 |
| 1.6860 | 76 | 62.04 | 1.3240 | 42 | 34.28 | 1.0536 | 8 | 6.53 |
| 1.6750 | 75 | 61.22 | 1.3150 | 41 | 33.47 | 1.0464 | 7 | 5.71 |
| 1.6630 | 74 | 60.40 | 1.3060 | 40 | 32.65 | 1.0390 | 6 | 4.89 |
| 1.6510 | 73 | 59.59 | 1.2976 | 39 | 31.83 | 1.0320 | 5 | 4.08 |
| 1.6390 | 72 | 58.77 | 1.2890 | 38 | 31.02 | 1.0256 | 4 | 3.26 |
| 1.6370 | 71 | 57.95 | 1.2810 | 37 | 30.20 | 1.0190 | 3 | 2.445 |
| 1.6150 | 70 | 57.14 | 1.2720 | 36 | 29.38 | 1.0130 | 2 | 1.63 |
| 1.6040 | 69 | 56.32 | 1.2640 | 35 | 28.57 | 1.0064 | 1 | 0.816 |
| 1.5920 | 68 | 55.59 | 1.2560 | 34 | 27.75 | | | |
| 1.5800 | 67 | 54.69 | 1.2476 | 33 | 26.94 | | | |

# TABLE

## OF THE SPECIFIC GRAVITY OF HYDROCHLORIC ACID AT 15° C.

URE. — Dict. Arts.

| Specific Gravity. | Per cent Hydrochloric Acid Gas. | Specific Gravity. | Per cent Hydrochloric Acid Gas. | Specific Gravity. | Per cent Hydrochloric Acid Gas. |
|---|---|---|---|---|---|
| 1.2000 | 40.777 | 1.1328 | 26.913 | 1.0657 | 13.456 |
| 1.1982 | 40.369 | 1.1308 | 26.505 | 1.0637 | 13.049 |
| 1.1964 | 39.961 | 1.1287 | 26.098 | 1.0617 | 12.641 |
| 1.1946 | 39.554 | 1.1267 | 25.690 | 1.0597 | 12.233 |
| 1.1928 | 39.146 | 1.1247 | 25.282 | 1.0577 | 11.825 |
| 1.1910 | 38.738 | 1.1226 | 24.874 | 1.0557 | 11.418 |
| 1.1893 | 38.330 | 1.1206 | 24.466 | 1.0537 | 11.010 |
| 1.1875 | 37.923 | 1.1185 | 24.058 | 1.0517 | 10.602 |
| 1.1857 | 37.516 | 1.1164 | 23.650 | 1.0497 | 10.194 |
| 1.1846 | 37.108 | 1.1143 | 23.242 | 1.0477 | 9.786 |
| 1.1822 | 36.700 | 1.1123 | 22.834 | 1.0457 | 9.379 |
| 1.1802 | 36.292 | 1.1102 | 22.426 | 1.0437 | 8.971 |
| 1.1782 | 35.884 | 1.1082 | 22.019 | 1.0417 | 8.563 |
| 1.1762 | 35.476 | 1.1061 | 21.611 | 1.0397 | 8.155 |
| 1.1741 | 35.068 | 1.1041 | 21.203 | 1.0377 | 7.747 |
| 1.1721 | 34.660 | 1.1020 | 20.796 | 1.0357 | 7.340 |
| 1.1701 | 34.252 | 1.1000 | 20.388 | 1.0337 | 6.932 |
| 1.1681 | 33.845 | 1.0980 | 19.980 | 1.0318 | 6.524 |
| 1.1661 | 33.437 | 1.0960 | 19.572 | 1.0298 | 6.116 |
| 1.1641 | 33.029 | 1.0939 | 19.165 | 1.0279 | 5.709 |
| 1.1620 | 32.621 | 1.0919 | 18.757 | 1.0259 | 5.301 |
| 1.1599 | 32 213 | 1.0899 | 18.349 | 1.0239 | 4.893 |
| 1.1578 | 31.805 | 1.0879 | 17.941 | 1.0220 | 4.486 |
| 1.1557 | 31.398 | 1.0859 | 17.534 | 1.0200 | 4.078 |
| 1.1537 | 30.990 | 1.0838 | 17.126 | 1.0180 | 3.670 |
| 1.1515 | 30.582 | 1.0818 | 16.718 | 1.0160 | 3.262 |
| 1.1494 | 30.174 | 1.0798 | 16.310 | 1.0140 | 2.854 |
| 1.1473 | 29.767 | 1.0778 | 15.902 | 1.0120 | 2.447 |
| 1.1452 | 29.359 | 1.0758 | 15.494 | 1.0100 | 2.039 |
| 1.1431 | 28.951 | 1.0738 | 15.087 | 1.0080 | 1.631 |
| 1.1410 | 28.544 | 1.0718 | 14.679 | 1.0060 | 1.124 |
| 1.1389 | 28.136 | 1.0697 | 14.271 | 1.0040 | 0.816 |
| 1.1369 | 27.728 | 1.0677 | 13.863 | 1.0020 | 0.408 |
| 1.1349 | 27.321 | | | | |

# TABLE

## OF THE SPECIFIC GRAVITY OF HYDRATED ACETIC ACID.

MOHR. — Ann. Pharm. 1839, 31, s. 284.

| Specific Gravity. | Per cent Hydrated Acetic Acid. | Specific Gravity. | Per cent Hydrated Acetic Acid. | Specific Gravity. | Per cent Hydrated Acetic Acid. | Specific Gravity. | Per cent Hydrated Acetic Acid. |
|---|---|---|---|---|---|---|---|
| 1.0635 | 100 | 1.0720 | 75 | 1.0600 | 50 | 1.0340 | 25 |
| 1.0655 | 99 | 1.0720 | 74 | 1.0590 | 49 | 1.0330 | 24 |
| 1.0670 | 98 | 1.0720 | 73 | 1.0580 | 48 | 1.0320 | 23 |
| 1.0680 | 97 | 1.0710 | 72 | 1.0560 | 47 | 1.0310 | 22 |
| 1.0690 | 96 | 1.0710 | 71 | 1.0550 | 46 | 1.0290 | 21 |
| 1.0700 | 95 | 1.0700 | 70 | 1.0550 | 45 | 1.0270 | 20 |
| 1.0706 | 94 | 1.0700 | 69 | 1.0540 | 44 | 1.0260 | 19 |
| 1.0708 | 93 | 1.0700 | 68 | 1.0530 | 43 | 1.0250 | 18 |
| 1.0716 | 92 | 1.0690 | 67 | 1.0520 | 42 | 1.0240 | 17 |
| 1.0721 | 91 | 1.0690 | 66 | 1.0515 | 41 | 1.0230 | 16 |
| 1.0730 | 90 | 1.0680 | 65 | 1.0513 | 40 | 1.0220 | 15 |
| 1.0730 | 89 | 1.0680 | 64 | 1.0500 | 39 | 1.0200 | 14 |
| 1.0730 | 88 | 1.0680 | 63 | 1.0490 | 38 | 1.0180 | 13 |
| 1.0730 | 87 | 1.0670 | 62 | 1.0480 | 37 | 1.0170 | 12 |
| 1.0730 | 86 | 1.0670 | 61 | 1.0470 | 36 | 1.0160 | 11 |
| 1.0730 | 85 | 1.0670 | 60 | 1.0460 | 35 | 1.0150 | 10 |
| 1.0730 | 84 | 1.0660 | 59 | 1.0450 | 34 | 1.0130 | 9 |
| 1.0730 | 83 | 1.0660 | 58 | 1.0440 | 33 | 1.0120 | 8 |
| 1.0730 | 82 | 1.0650 | 57 | 1.0424 | 32 | 1.0100 | 7 |
| 1.0732 | 81 | 1.0640 | 56 | 1.0410 | 31 | 1.0080 | 6 |
| 1.0735 | 80 | 1.0640 | 55 | 1.0400 | 30 | 1.0067 | 5 |
| 1.0735 | 79 | 1.0630 | 54 | 1.0390 | 29 | 1.0055 | 4 |
| 1.0732 | 78 | 1.0630 | 53 | 1.0380 | 28 | 1.0040 | 3 |
| 1.0732 | 77 | 1.0620 | 52 | 1.0360 | 27 | 1.0020 | 2 |
| 1.0730 | 76 | 1.0610 | 51 | 1.0350 | 26 | 1.0010 | 1 |

When water is added to Hydrated Acetic Acid the Specific Gravity of the fluid does not fall; on the contrary, it rises until 3 atoms or 51.5 per cent have been added.

In reference to this, Thompson gives the following Table.

EQUIVALENTS OF ACID AND WATER AT 15° C.

| Acid. | Water. | Specific Gravity. | Acid. | Water. | Specific Gravity. |
|---|---|---|---|---|---|
| 1 | 1 | 1.06296 | 1 | 6 | 1.06708 |
| 1 | 2 | 1.07060 | 1 | 7 | 1.06349 |
| 1 | 3 | 1.07084 | 1 | 8 | 1.05974 |
| 1 | 4 | 1.07132 | 1 | 9 | 1.05794 |
| 1 | 5 | 1.06820 | 1 | 10 | 1.05439 |

# TABLE

## OF THE PROPORTION BY WEIGHT OF ABSOLUTE ALCOHOL IN SPIRITS OF DIFFERENT SPECIFIC GRAVITIES AT 15°.5 C.

FOWNES'S Chem., p. 579.

| Specific Gravity. | Per cent. | Specific Gravity. | Per cent. | Specific Gravity. | Per cent. |
|---|---|---|---|---|---|
| 0.9991 | ½ | 0.9511 | 34 | 0.8769 | 68 |
| 0.9981 | 1 | 0.9490 | 35 | 0.8745 | 69 |
| 0.9965 | 2 | 0.9470 | 36 | 0.8721 | 70 |
| 0.9947 | 3 | 0.9452 | 37 | 0.8696 | 71 |
| 0.9930 | 4 | 0.9434 | 38 | 0.8672 | 72 |
| 0.9914 | 5 | 0.9416 | 39 | 0.8649 | 73 |
| 0.9898 | 6 | 0.9396 | 40 | 0.8625 | 74 |
| 0.9884 | 7 | 0.9376 | 41 | 0.8603 | 75 |
| 0.9869 | 8 | 0.9356 | 42 | 0.8581 | 76 |
| 0.9855 | 9 | 0.9335 | 43 | 0.8557 | 77 |
| 0.9841 | 10 | 0.9314 | 44 | 0.8533 | 78 |
| 0.9828 | 11 | 0.9292 | 45 | 0.8508 | 79 |
| 0.9815 | 12 | 0.9270 | 46 | 0.8483 | 80 |
| 0.9802 | 13 | 0.9249 | 47 | 0.8459 | 81 |
| 0.9789 | 14 | 0.9228 | 48 | 0.8434 | 82 |
| 0.9778 | 15 | 0.9206 | 49 | 0.8408 | 83 |
| 0.9766 | 16 | 0.9184 | 50 | 0.8382 | 84 |
| 0.9753 | 17 | 0.9160 | 51 | 0.8357 | 85 |
| 0.9741 | 18 | 0.9135 | 52 | 0.8331 | 86 |
| 0.9728 | 19 | 0.9113 | 53 | 0.8305 | 87 |
| 0.9716 | 20 | 0.9090 | 54 | 0.8279 | 88 |
| 0.9704 | 21 | 0.9069 | 55 | 0.8254 | 89 |
| 0.9691 | 22 | 0.9047 | 56 | 0.8228 | 90 |
| 0.9678 | 23 | 0.9025 | 57 | 0.8199 | 91 |
| 0.9665 | 24 | 0.9001 | 58 | 0.8172 | 92 |
| 0.9652 | 25 | 0.8979 | 59 | 0.8145 | 93 |
| 0.9638 | 26 | 0.8956 | 60 | 0.8118 | 94 |
| 0.9623 | 27 | 0.8932 | 61 | 0.8089 | 95 |
| 0.9609 | 28 | 0.8908 | 62 | 0.8061 | 96 |
| 0.9593 | 29 | 0.8886 | 63 | 0.8031 | 97 |
| 0.9578 | 30 | 0.8863 | 64 | 0.8001 | 98 |
| 0.9560 | 31 | 0.8840 | 65 | 0.7969 | 99 |
| 0.9544 | 32 | 0.8816 | 66 | 0.7938 | 100 |
| 0.9528 | 33 | 0.8793 | 67 | | |

# TABLE

## OF THE SPECIFIC GRAVITY OF A MIXTURE OF ALCOHOL AND WATER BY VOLUME.

*Temperature* = 15°.56 *C.* *Water* = 1 *at* 3°.9 *C.*

TRALLES. — Gilbert's Annalen der Phys., 1811, 38, s. 368.

| Per cent Alcohol. | Specific Gravity. | Per cent Alcohol. | Specific Gravity. | Per cent Alcohol. | Specific Gravity. |
|---|---|---|---|---|---|
| 1 | 9976 | 35 | 9583 | 68 | 8941 |
| 2 | 9961 | 36 | 9570 | 69 | 8917 |
| 3 | 9947 | 37 | 9559 | 70 | 8892 |
| 4 | 9933 | 38 | 9541 | 71 | 8867 |
| 5 | 9919 | 39 | 9526 | 72 | 8842 |
| 6 | 9906 | 40 | 9510 | 73 | 8817 |
| 7 | 9893 | 41 | 9494 | 74 | 8791 |
| 8 | 9881 | 42 | 9478 | 75 | 8765 |
| 9 | 9869 | 43 | 9461 | 76 | 8739 |
| 10 | 9857 | 44 | 9444 | 77 | 8712 |
| 11 | 9845 | 45 | 9427 | 78 | 8685 |
| 12 | 9834 | 46 | 9409 | 79 | 8658 |
| 13 | 9823 | 47 | 9391 | 80 | 8631 |
| 14 | 9812 | 48 | 9373 | 81 | 8603 |
| 15 | 9802 | 49 | 9354 | 82 | 8575 |
| 16 | 9791 | 50 | 9335 | 83 | 8547 |
| 17 | 9781 | 51 | 9315 | 84 | 8518 |
| 18 | 9771 | 52 | 9295 | 85 | 8488 |
| 19 | 9761 | 53 | 9275 | 86 | 8458 |
| 20 | 9751 | 54 | 9254 | 87 | 8428 |
| 21 | 9741 | 55 | 9234 | 88 | 8397 |
| 22 | 9731 | 56 | 9213 | 89 | 8365 |
| 23 | 9720 | 57 | 9192 | 90 | 8332 |
| 24 | 9710 | 58 | 9170 | 91 | 8299 |
| 25 | 9700 | 59 | 9148 | 92 | 8265 |
| 26 | 9689 | 60 | 9126 | 93 | 8230 |
| 27 | 9679 | 61 | 9104 | 94 | 8194 |
| 28 | 9668 | 62 | 9082 | 95 | 8157 |
| 29 | 9657 | 63 | 9059 | 96 | 8118 |
| 30 | 9646 | 64 | 9036 | 97 | 8077 |
| 31 | 9634 | 65 | 9013 | 98 | 8034 |
| 32 | 9622 | 66 | 8989 | 99 | 7988 |
| 33 | 9609 | 67 | 8965 | 100 | 7939 |
| 34 | 9596 | | | | |

# TABLE

## FOR THE MIXING OF WATER AND ALCOHOL ACCORDING TO VOLUME, AT 17°.5 C.

MEISSNER'S Ariometrie.

| A mixture of | | Specific Gravity. | The Volume becomes after mixing. | A mixture of | | Specific Gravity. | The Volume becomes after mixing. | A mixture of | | Specific Gravity. | The Volume becomes after mixing. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Volumes Alcohol. | Volumes Water. | | | Volumes Alcohol. | Volumes Water. | | | Volumes Alcohol. | Volumes Water. | | |
| 100 | 0 | 0.7932 | | 66 | 34 | 0.8934 | 96.651 | 32 | 68 | 0.9621 | 97.056 |
| 99 | 1 | 0.7969 | 99.802 | 65 | 35 | 0.8958 | 96.626 | 31 | 69 | 0.9632 | 97.158 |
| 98 | 2 | 0.8006 | 99.618 | 64 | 36 | 0.8982 | 96.602 | 30 | 70 | 0.9643 | 97.268 |
| 97 | 3 | 0.8042 | 99.425 | 63 | 37 | 0.9006 | 96.580 | 29 | 71 | 0.9654 | 97.367 |
| 96 | 4 | 0.8078 | 89.229 | 62 | 38 | 0.9029 | 96.559 | 28 | 72 | 0.9665 | 97.466 |
| 95 | 5 | 0.8114 | 99.031 | 61 | 39 | 0.9052 | 96.539 | 27 | 73 | 0.9676 | 97.565 |
| 94 | 6 | 0.8150 | 98.824 | 60 | 40 | 0.9075 | 96.520 | 26 | 74 | 0.9688 | 97.664 |
| 93 | 7 | 0.8185 | 98.644 | 59 | 41 | 0.9098 | 96.501 | 25 | 75 | 0.9700 | 97.763 |
| 92 | 8 | 0.8219 | 98.484 | 58 | 42 | 0.9121 | 96.484 | 24 | 76 | 0.9712 | 97.862 |
| 91 | 9 | 0.8253 | 98.334 | 57 | 43 | 0.9145 | 96.463 | 23 | 77 | 0.9723 | 97.958 |
| 90 | 10 | 0.8286 | 98.224 | 56 | 44 | 0.9168 | 96.445 | 22 | 78 | 0.9734 | 98.051 |
| 89 | 11 | 0.8317 | 98.131 | 55 | 45 | 0.9191 | 96.427 | 21 | 79 | 0.9745 | 98.149 |
| 88 | 12 | 0.8346 | 98.044 | 54 | 46 | 0.9214 | 96.413 | 20 | 80 | 0.9756 | 98.262 |
| 87 | 13 | 0.8373 | 97.962 | 53 | 47 | 0.9237 | 96.402 | 19 | 81 | 0.9766 | 98.377 |
| 86 | 14 | 0.8400 | 97.883 | 52 | 48 | 0.9259 | 96.393 | 18 | 82 | 0.9775 | 98.494 |
| 85 | 15 | 0.8427 | 97.807 | 51 | 49 | 0.9281 | 96.384 | 17 | 83 | 0.9784 | 98.613 |
| 84 | 16 | 0.8454 | 97.733 | 50 | 50 | 0.9303 | 96.377 | 16 | 84 | 0.9793 | 98.731 |
| 83 | 17 | 0.8481 | 97.661 | 49 | 51 | 0.9324 | 96.384 | 15 | 85 | 0.9803 | 98.845 |
| 82 | 18 | 0.8508 | 97.592 | 48 | 52 | 0.9344 | 96.394 | 14 | 86 | 0.9813 | 98.955 |
| 81 | 19 | 0.8534 | 97.525 | 47 | 53 | 0.9364 | 96.407 | 13 | 87 | 0.9823 | 99.058 |
| 80 | 20 | 0.8566 | 97.462 | 46 | 54 | 0.9384 | 96.423 | 12 | 88 | 0.9834 | 99.154 |
| 79 | 21 | 0.8591 | 97.404 | 45 | 55 | 0.9404 | 96.442 | 11 | 89 | 0.9846 | 99.246 |
| 78 | 22 | 0.8616 | 97.347 | 44 | 56 | 0.9424 | 96.465 | 10 | 90 | 0.9859 | 99.333 |
| 77 | 23 | 0.8642 | 97.291 | 43 | 57 | 0.9443 | 96.495 | 9 | 91 | 0.9873 | 99.413 |
| 76 | 24 | 0.8668 | 97.234 | 42 | 58 | 0.9461 | 96.528 | 8 | 92 | 0.9888 | 99.487 |
| 75 | 25 | 0.8695 | 97.176 | 41 | 59 | 0.9478 | 96.565 | 7 | 93 | 0.9901 | 99.555 |
| 74 | 26 | 0.8723 | 97.111 | 40 | 60 | 0.9495 | 96.607 | 6 | 94 | 0.9915 | 99.617 |
| 73 | 27 | 0.8751 | 97.040 | 39 | 61 | 0.9512 | 96.649 | 5 | 95 | 0.9929 | 99.674 |
| 72 | 28 | 0.8779 | 96.966 | 38 | 62 | 0.9529 | 96.692 | 4 | 96 | 0.9943 | 99.731 |
| 71 | 29 | 0.8806 | 96.892 | 37 | 63 | 0.9547 | 96.736 | 3 | 97 | 0.9957 | 99.792 |
| 70 | 30 | 0.8833 | 96.821 | 36 | 64 | 0.9564 | 96.782 | 2 | 98 | 0.8971 | 99.857 |
| 69 | 31 | 0.8860 | 96.765 | 35 | 65 | 0.9580 | 96.829 | 1 | 99 | 0.9985 | 99.927 |
| 68 | 32 | 0.8885 | 96.723 | 34 | 66 | 0.9595 | 96.889 | 0 | 100 | 1.0000 | |
| 67 | 33 | 0.8910 | 96.685 | 33 | 67 | 0.9609 | 96.967 | | | | |

# TABLE

## FOR THE MIXING OF ALCOHOL AND WATER BY WEIGHT AT 17°.5 C.

MEISSNER'S Ariometric.

| Parts Alcohol. | Parts Water. | Specific Gravity. | Parts Alcohol. | Parts Water. | Specific Gravity. | Parts Alcohol. | Parts Water. | Specific Gravity. |
|---|---|---|---|---|---|---|---|---|
| 100 | 0 | 0.7932 | 66 | 34 | 0.8806 | 32 | 68 | 0.9543 |
| 99 | 1 | 0.7960 | 65 | 35 | 0.8831 | 31 | 69 | 0.9561 |
| 98 | 2 | 0.7988 | 64 | 36 | 0.8855 | 30 | 70 | 0.9578 |
| 97 | 3 | 0.8016 | 63 | 37 | 0.8879 | 29 | 71 | 0.9594 |
| 96 | 4 | 0.8045 | 62 | 38 | 0.8902 | 28 | 72 | 0.9608 |
| 95 | 5 | 0.8074 | 61 | 39 | 0.8925 | 27 | 73 | 0.9621 |
| 94 | 6 | 0.8104 | 60 | 40 | 0.8948 | 26 | 74 | 0.9634 |
| 93 | 7 | 0.8135 | 59 | 41 | 0.8971 | 25 | 75 | 0.9647 |
| 92 | 8 | 0.8166 | 58 | 42 | 0.8994 | 24 | 76 | 0.9660 |
| 91 | 9 | 0.8196 | 57 | 43 | 0.9016 | 23 | 77 | 0.9673 |
| 90 | 10 | 0.8225 | 56 | 44 | 0.9038 | 22 | 78 | 0.9686 |
| 89 | 11 | 0.8252 | 55 | 45 | 0.9060 | 21 | 79 | 0.9699 |
| 88 | 12 | 0.8279 | 54 | 46 | 0.9082 | 20 | 80 | 0.9712 |
| 87 | 13 | 0.8304 | 53 | 47 | 0.9104 | 19 | 81 | 0.9725 |
| 86 | 14 | 0.8329 | 52 | 48 | 0.9127 | 18 | 82 | 0.9738 |
| 85 | 15 | 0.8353 | 51 | 49 | 0.9150 | 17 | 83 | 0.9751 |
| 84 | 16 | 0.8376 | 50 | 50 | 0.9173 | 16 | 84 | 0.9763 |
| 83 | 17 | 0.8399 | 49 | 51 | 0.9196 | 15 | 85 | 0.9775 |
| 82 | 18 | 0.8422 | 48 | 52 | 0.9219 | 14 | 86 | 0.9786 |
| 81 | 19 | 0.8446 | 47 | 53 | 0.9242 | 13 | 87 | 0.9796 |
| 80 | 20 | 0.8470 | 46 | 54 | 0.9264 | 12 | 88 | 0.9806 |
| 79 | 21 | 0.8494 | 45 | 55 | 0.9280 | 11 | 89 | 0.9817 |
| 78 | 22 | 0.8519 | 44 | 56 | 0.9308 | 10 | 90 | 0.9830 |
| 77 | 23 | 0.8543 | 43 | 57 | 0.9329 | 9 | 91 | 0.9844 |
| 76 | 24 | 0.8567 | 42 | 58 | 0.9350 | 8 | 92 | 0.9860 |
| 75 | 25 | 0.8590 | 41 | 59 | 0.9371 | 7 | 93 | 0.9878 |
| 74 | 26 | 0.8613 | 40 | 60 | 0.9391 | 6 | 94 | 0.9897 |
| 73 | 27 | 0.8635 | 39 | 61 | 0.9410 | 5 | 95 | 0.9914 |
| 72 | 28 | 0.8657 | 38 | 62 | 0.9429 | 4 | 96 | 0.9931 |
| 71 | 29 | 0.8680 | 37 | 63 | 0.9448 | 3 | 97 | 0.9948 |
| 70 | 30 | 0.8704 | 36 | 64 | 0.9467 | 2 | 98 | 0.9965 |
| 69 | 31 | 0.8729 | 35 | 65 | 0.9486 | 1 | 99 | 0.9982 |
| 68 | 32 | 0.8755 | 34 | 66 | 0.9505 | 0 | 100 | 1.0000 |
| 67 | 33 | 0.8781 | 33 | 67 | 0.9524 | | | |

# TABLE

## OF THE PER CENT OF COMMON SALT (NaCl) IN SOLUTIONS OF 1.001 TO 1.20467 SPECIFIC GRAVITY, AT 18°.75 C.

MUSPRATT'S Chemie.

| Specific Gravity. | Per cent. | Specific Gravity. | Per cent. | Specific Gravity. | Per cent. |
|---|---|---|---|---|---|
| 1.001 | 0.1361 | 1.034 | 4.7038 | 1.067 | 9.2055 |
| 1.002 | 0.2731 | 1.035 | 4.8417 | 1.068 | 9.3402 |
| 1.003 | 0.4105 | 1.036 | 4.9795 | 1.069 | 9.4747 |
| 1.004 | 0.5483 | 1.037 | 5.1172 | 1.070 | 9.6091 |
| 1.005 | 0.6863 | 1.038 | 5.2549 | 1.071 | 9.7434 |
| 1.006 | 0.8245 | 1.039 | 5.3925 | 1.072 | 9.8776 |
| 1.007 | 0.9628 | 1.040 | 5.5300 | 1.073 | 10.0117 |
| 1.008 | 1.1013 | 1.041 | 5.6674 | 1.074 | 10.1457 |
| 1.009 | 1.2398 | 1.042 | 5.8047 | 1.075 | 10.2795 |
| 1.010 | 1.3785 | 1.043 | 5.9420 | 1.076 | 10.4132 |
| 1.011 | 1.5172 | 1.044 | 6.0791 | 1.077 | 10.5469 |
| 1.012 | 1.6559 | 1.045 | 6.2161 | 1.078 | 10.6804 |
| 1.013 | 1.7947 | 1.046 | 6.3531 | 1.079 | 10.8137 |
| 1.014 | 1.9335 | 1.047 | 6.4900 | 1.080 | 10.9470 |
| 1.015 | 2.0723 | 1.048 | 6.6267 | 1.081 | 11.0802 |
| 1.016 | 2.2111 | 1.049 | 6.7634 | 1.082 | 11.2132 |
| 1.017 | 2.3499 | 1.050 | 6.9000 | 1.083 | 11.3461 |
| 1.018 | 2.4887 | 1.051 | 7.0364 | 1.084 | 11.4789 |
| 1.019 | 2.6275 | 1.052 | 7.1728 | 1.085 | 11.6116 |
| 1.020 | 2.7662 | 1.053 | 7.3090 | 1.086 | 11.7441 |
| 1.021 | 2.9049 | 1.054 | 7.4452 | 1.087 | 11.8766 |
| 1.022 | 3.0436 | 1.055 | 7.5812 | 1.088 | 12.0089 |
| 1.023 | 3.1823 | 1.056 | 7.7172 | 1.089 | 12.1411 |
| 1.024 | 3.3209 | 1.057 | 7.8530 | 1.090 | 12.2732 |
| 1.025 | 3.4594 | 1.058 | 7.9888 | 1.091 | 12.4052 |
| 1.026 | 3.5979 | 1.059 | 8.1244 | 1.092 | 12.5370 |
| 1.027 | 3.7364 | 1.060 | 8.2599 | 1.093 | 12.6687 |
| 1.028 | 3.8748 | 1.061 | 8.3953 | 1.094 | 12.8004 |
| 1.029 | 4.0131 | 1.062 | 8.5307 | 1.095 | 12.9318 |
| 1.030 | 4.1514 | 1.063 | 8.6659 | 1.096 | 13.0632 |
| 1.031 | 4.2896 | 1.064 | 8.8009 | 1.097 | 13.1945 |
| 1.032 | 4.4277 | 1.065 | 8.9359 | 1.098 | 13.3256 |
| 1.033 | 4.5658 | 1.066 | 9.0708 | 1.099 | 13.4566 |

| Specific Gravity. | Per cent. | Specific Gravity. | Per cent. | Specific Gravity. | Per cent. |
|---|---|---|---|---|---|
| 1.100 | 13.5875 | 1.136 | 18.2189 | 1.171 | 22.5726 |
| 1.101 | 13.7183 | 1.137 | 18.3454 | 1.172 | 22.6949 |
| 1.102 | 13.8489 | 1.138 | 18.4717 | 1.173 | 22.8170 |
| 1.103 | 13.9794 | 1.139 | 18.5978 | 1.174 | 22.9390 |
| 1.104 | 14.1098 | 1.140 | 18.7239 | 1.175 | 23.0610 |
| 1.105 | 14.2401 | 1.141 | 18.8498 | 1.176 | 23.1828 |
| 1.106 | 14.3703 | 1.142 | 18.9757 | 1.177 | 23.3045 |
| 1.107 | 14.5003 | 1.143 | 19.1014 | 1.178 | 23.4260 |
| 1.108 | 14.6302 | 1.144 | 19.2269 | 1.179 | 23.5475 |
| 1.109 | 14.7600 | 1.145 | 19.3524 | 1.180 | 23.6688 |
| 1.110 | 14.8897 | 1.146 | 19.4777 | 1.181 | 23.7900 |
| 1.111 | 15.0193 | 1.147 | 19.6029 | 1.182 | 23.9111 |
| 1.112 | 15.1487 | 1.148 | 19.7280 | 1.183 | 24.0321 |
| 1.113 | 15.2780 | 1.149 | 19.8530 | 1.184 | 24.1530 |
| 1.114 | 15.4072 | 1.150 | 19.9779 | 1.185 | 24.2738 |
| 1.115 | 15.5363 | 1.151 | 20.1026 | 1.186 | 24.3945 |
| 1.116 | 15.6653 | 1.152 | 20.2272 | 1.187 | 24.5150 |
| 1.117 | 15.7941 | 1.153 | 20.3517 | 1.188 | 24.6354 |
| 1.118 | 15.9228 | 1.154 | 20.4761 | 1.189 | 24.7557 |
| 1.119 | 16.0514 | 1.155 | 20.6004 | 1.190 | 24.8759 |
| 1.120 | 16.1799 | 1.156 | 20.7245 | 1.191 | 24.9960 |
| 1.121 | 16.3082 | 1.157 | 20.8486 | 1.192 | 25.1159 |
| 1.122 | 16.4365 | 1.158 | 20.9725 | 1.193 | 25.2358 |
| 1.123 | 16.5645 | 1.159 | 21.0963 | 1.194 | 25.3555 |
| 1.124 | 16.6925 | 1.160 | 21.2199 | 1.195 | 25.4752 |
| 1.125 | 16.8204 | 1.161 | 21.3435 | 1.196 | 25.5947 |
| 1.126 | 16.9482 | 1.162 | 21.4669 | 1.197 | 25.7141 |
| 1.127 | 17.0758 | 1.163 | 21.5903 | 1.198 | 25.8333 |
| 1.128 | 17.2033 | 1.164 | 21.7135 | 1.199 | 25.9525 |
| 1.129 | 17.3307 | 1.165 | 21.8365 | 1.200 | 26.0716 |
| 1.130 | 17.4579 | 1.166 | 21.9595 | 1.201 | 26.1905 |
| 1.131 | 17.5851 | 1.167 | 22.0824 | 1.202 | 26.3094 |
| 1.132 | 17.7121 | 1.168 | 22.2051 | 1.203 | 26.4281 |
| 1.133 | 17.8390 | 1.169 | 22.3277 | 1.204 | 26.5467 |
| 1.134 | 17.9657 | 1.170 | 22.4502 | 1.20467 | 26.6261 |
| 1.135 | 18.0924 | | | | |

# TABLES

# RELATING TO HEAT.

# TABLE

## OF THE SPECIFIC AND ATOMIC HEAT OF THE ELEMENTS.

*Calculated from Regnault's data.*

| Name of Element. | Specific Heat. | Atomic Weight. | Specific Heat × Atomic Weight. | Name of Element. | Specific Heat. | Atomic Weight. | Specific Heat × Atomic Weight. |
|---|---|---|---|---|---|---|---|
| Diamond | 0.14680 | 48.0 ? | 6.04640 | Mercury, Solid | 0.03192 | 200.0 | 6.38400 |
| Graphite | 0.20180 | 33.0 ? | 6.65940 | " Liquid | 0.03332 | 200.0 | 6.66400 |
| Wood, Charcoal | 0.24150 | | | Platinum | 0.03243 | 198.0 | 6.42114 |
| Silicon, fused | 0.17500 | 35.0 ? | 6.12500 | Palladium | 0.05927 | 106.4 | 6.30630 |
| " Crystallized | 0.17670 | | | Rhodium | 0.05803 | 104.0 | 6.03510 |
| Boron " | 0.25000 | | | Osmium | 0.03063 | 194.0 | 5.94220 |
| Sulphur (Native) | 0.17760 | 32.0 | 5.68320 | Iridium | 0.03259 | 196.0 | 6.38760 |
| Selenium | 0.08370 | 79.0 | 6.61230 | Iodine | 0.05412 | 127.0 | 6.87320 |
| Tellurium | 0.04737 | 128.0 | 6.06330 | Bromine, Solid | 0.08430 | 80.0 | 6.74400 |
| Magnesium | 0.24990 | 24.0 | 5.99760 | " Liquid | 0.10600 | 80.0 | 8.48000 |
| Zinc | 0.09555 | 65.0 | 6.25880 | Potassium | 0.16956 | 39.0 | 6.61280 |
| Cadmium | 0.05669 | 112.0 | 6.34820 | Sodium | 0.29340 | 23.0 | 6.74800 |
| Aluminum | 0.21430 | 27.5 | 5.87300 | Lithium | 0.94080 | 7.0 | 6.58560 |
| Iron | 0.11379 | 56.0 | 6.37220 | Phosphorus | 0.18870 | 31.0 | 5.84970 |
| Nickel | 0.10863 | 58.0 | 6.30054 | Arsenic | 0.08140 | 75.0 | 6.10500 |
| Cobalt | 0.10696 | 60.0 | 6.41760 | Antimony | 0.05077 | 120.0 | 6.09240 |
| Manganese | 0.12170 | 54.0 | 6.57180 | Bismuth | 0.03084 | 208.0 | 6.41472 |
| Tin | 0.05623 | 116.0 | 6.52268 | Thallium | 0.03355 | 204.0 | 6.84420 |
| Tungsten | 0.03342 | 184.0 | 6.14920 | Silver | 0.05701 | 108.0 | 6.15700 |
| Copper | 0.09515 | 63.5 | 6.04190 | Gold | 0.03244 | 197.0 | 6.39068 |
| Lead | 0.03140 | 207.0 | 6.49990 | | | | |

# TABLE

## OF SPECIFIC HEATS OF SOME OF THE MOST COMMON SUBSTANCES.

REGNAULT. — Annales de Chimie et de Physique, III., I., p. 172.

| Name. | Specific Heat. | Name. | Specific Heat. |
|---|---|---|---|
| Protoxide of Lead, powder. | 0.05118 | Bisulphide of Iron (Pyrites) | 0.13009 |
| " fused | 0.05089 | " Tin | 0.11932 |
| Oxide of Mercury (HgO) | 0.05179 | " Molybdenum | 0.12334 |
| Protoxide of Manganese | 0.15701 | Subsulphide of Copper | 0.12118 |
| Oxide of Copper | 0.14201 | " Silver | 0.07460 |
| " Nickel | 0.16234 | Magnetic Pyrites | 0.16023 |
| " " calcined | 0.15885 | Chloride of Sodium | 0.21401 |
| Magnesia | 0.24394 | Chloride of Potassium | 0.17295 |
| Oxide of Zinc | 0.12480 | Subchloride of Mercury | 0.05205 |
| Sesquioxide of Iron | 0.16695 | " Copper | 0.13827 |
| Arsenous Acid | 0.12786 | Chloride of Silver | 0.09109 |
| Sesquioxide of Chromium | 0.17960 | " Barium | 0.08570 |
| Oxide of Bismuth | 0.06053 | " Strontium | 0.11990 |
| Teroxide of Antimony | 0.09009 | " Calcium | 0.16420 |
| Corundum | 0.19762 | " Magnesium | 0.19460 |
| Sapphire | 0.21732 | " Lead | 0.06641 |
| Stannic Acid | 0.09382 | " Mercury | 0.06889 |
| Titanic Acid, artificial | 0.17164 | " Zinc | 0.13618 |
| " rutile | 0.17032 | " Tin | 0.10161 |
| Tungstic Acid | 0.07983 | " Manganese | 0.14255 |
| Molybdic Acid | 0.13240 | Bichloride of Tin | 0.14759 |
| Silica | 0.19132 | " Titanium | 0.19145 |
| Boric Acid | 0.23743 | Terchloride of Arsenic | 0.17478 |
| Magnetic Oxide of Iron | 0.16780 | " Phosphorus | 0.20922 |
| Protosulphide of Iron | 0.13570 | Bromide of Potassium | 0.11322 |
| Sulphide of Nickel | 0.12814 | " Silver | 0.07391 |
| " Cobalt | 0.12512 | " Sodium | 0.13842 |
| " Zinc | 0.12303 | " Lead | 0.05326 |
| " Lead | 0.05086 | Iodide of Potassium | 0.08191 |
| " Mercury | 0.05117 | " Sodium | 0.08684 |
| " Tin | 0.08365 | Subiodide of Mercury | 0.03949 |
| " Antimony | 0.08403 | Iodide of Silver | 0.06159 |
| " Bismuth | 0.06002 | Subiodide of Copper | 0.06869 |

| Name. | Specific Heat. | Name. | Specific Heat. |
|---|---|---|---|
| Iodide of Lead | 0.04267 | Sulphate of Magnesium | 0.22159 |
| " Mercury | 0.04197 | Chromate of Potassium | 0.18505 |
| Fluoride of Calcium | 0.21492 | Bichromate of Potassium | 0 18937 |
| Nitrate of Potassium | 0.23875 | Biborate " | 0.21975 |
| " Sodium | 0.27821 | " Sodium | 0.23823 |
| " Silver | 0.14352 | " Lead | 0.11409 |
| " Barium | 0.15228 | Borate of Potassium | 0.20478 |
| Chlorate of Potassium | 0.10956 | " Sodium | 0.25709 |
| Pyrophosphate of Potassium | 0.19102 | " Lead | 0.09046 |
| " Sodium | 0.22833 | Wolfram | 0.09780 |
| " Lead | 0.08208 | Zircon | 0.14558 |
| Metaphosphate of Calcium | 0.19923 | Carbonate of Potassium | 0.21623 |
| Phosphate of Lead | 0.07982 | " Sodium | 0.27275 |
| Arseniate of Potassium | 0.15631 | Iceland Spar | 0.20858 |
| " Lead | 0.07280 | Arragonite | 0.20850 |
| Sulphate of Potassium | 0.19010 | White Granular Marble | 0.21585 |
| " Sodium | 0.23115 | Gray " " | 0.20989 |
| " Barium | 0.11285 | White Chalk | 0.21401 |
| " Strontium | 0.14279 | Carbonate of Barium | 0.11038 |
| " Lead | 0.08723 | " Iron | 0.19345 |
| " Calcium | 0.19656 | " Strontium | 0.14483 |

## LATENT HEAT OF VAPORIZATION.

* FAVRE AND SILBERMAN. — Ann. Chem. Phys. [3] XXXVII. p. 464-470.

† ANDREWS. — Chem. Soc. Qu. Jour. I. p. 27.

| Substance. | Latent heat of Vapor. | Substance. | Latent heat of Vapor. |
|---|---|---|---|
| Bromine | 45.60† | Butyric Acid | 114.67* |
| Terchloride of Phosphorus | 51.42† | Acetate of Ethyl | 105.80* |
| Sulphide of Carbon | 86.67† | " " | 92.68† |
| Bichloride of Tin | 3.05† | Acetate of Methyl | 110.20† |
| Alcohol | 208.92* | Formate of Ethyl | 105.30† |
| " | 202.40† | " Methyl | 117.10† |
| Methylic Alcohol | 263.86* | Iodide of Ethyl | 46.87† |
| " " | 263.70† | " Methyl | 46.07† |
| Amylic Alcohol | 121.37* | Oxalate of Ethyl | 72.72† |
| Acetic Acid | 101.91* | Butyrate of Methyl | 87.33* |
| Formic Acid | 120.72* | Ethal | 58.44* |
| Ether | 91.11* | Oil of Turpentine | 68.73* |
| " | 90.45† | Terebene | 67.21* |
| Amylic Ether | 69.40* | Oil of Lemons | 70.02* |
| Valerianic Acid | 103.52* | | |

# TABLE

## OF THE SPECIFIC HEAT OF BODIES IN THE SOLID, LIQUID, AND GASEOUS STATES.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 327.

| Name. | Solid. | | Liquid. | | Gaseous. | |
|---|---|---|---|---|---|---|
| | Temperature. | Sp. Heat. | Temperature. | Sp. Heat. | Temperature. | Sp. Heat. |
| | °C. | | °C. | | °C. | |
| Water | —78 to 0 | 0.4740 | 10 | 1.0000 | 128 to 220 | 0.4805 |
| | —20 to 0 | 0.5040 | 10 to 100 | 1.0000 | | |
| Bromine | —77.8 to —25 | 0.0833 | — 7.3 to + 10 | 0.1060 | 83 to 228 | 0.0555 |
| | | | + 13 to + 58 | 0.1129 | | |
| Alcohol | | | — 20 | 0.5053 | 105 to 220 | 0.4534 |
| | | | 0 | 0.5475 | | |
| | | | + 20 | 0.5951 | | |
| | | | 40 | 0.6479 | | |
| | | | 60 | 0.7060 | | |
| | | | 80 | 0.7694 | | |
| Ether | | | — 30 | 0.5113 | 70 to 220 | 0.4797 |
| | | | 0 | 0.5290 | | |
| | | | + 30 | 0.5467 | | |
| | | | 35 | 0.5497 | | |
| Bisulphide of Carbon | | | — 30 | 0.2303 | 73 to 192 | 0.1570 |
| | | | 0 | 0.2352 | | |
| | | | + 30 | 0.2401 | | |
| | | | 45 | 0.2426 | | |
| Wood Spirits | | | 0 to 20 | 0.6700 | 101 to 223 | 0.4580 |
| Acetone | | | — 30 | 0.4824 | 129 to 233 | 0.4125 |
| | | | 0 | 0.5064 | | |
| | | | + 30 | 0.5302 | | |
| | | | 60 | 0.5540 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sulphide of Ethyl | | | 20 to 70 | | 0.4785 | 120 to 228 | 0.4008 |
| Chloride of Ethyl | | | − 27.6 to + 4.5 | | 0.4276 | 19 to 172 | 0.2738 |
| Bromide of Ethyl | | | 0 to 20 | | 0.2160 | 77.7 to 196.5 | 0.1896 |
| Cyanide of Ethyl | | | − 30 | | 0.4325 | 114 to 221 | 0.4262 |
| | | | 0 | | 0.5086 | | |
| | | | + 30 | | 0.5847 | | |
| | | | 60 | | 0.6608 | | |
| | | | 90 | | 0.7369 | | |
| Acetate of Ethyl | | | − 30 | | 0.4960 | 115 to 219 | 0.4008 |
| | | | 0 | | 0.5274 | | |
| | | | + 30 | | 0.5588 | | |
| | | | 60 | | 0.5902 | | |
| Chloroform | | | − 30 | | 0.2293 | 117 to 228 | 0.1567 |
| | | | 0 | | 0.2324 | | |
| | | | + 30 | | 0.2354 | | |
| | | | 60 | | 0.2384 | | |
| Dutch Liquid | | | − 30 | | 0.2790 | 111 to 221 | 0.2293 |
| | | | 0 | | 0.2922 | | |
| | | | + 30 | | 0.3054 | | |
| | | | 60 | | 0.3186 | | |
| Benzine | | | 20 to 71 | | 0.4360 | 116 to 218 | 0.3754 |
| Turpentine | | | 0 | | 0.4106 | 179 to 249 | 0.5061 |
| | | | 40 | | 0.4538 | | |
| | | | 80 | | 0.4842 | | |
| | | | 120 | | 0.5019 | | |
| | | | 160 | | 0.5068 | | |
| Chloride Silicon | | | 0 to 20 | | 0.1900 | 90 to 234 | 0.1322 |
| Perchloride of Phosphorus | | | 12 to 98 | | 0.2092 | 112 to 246 | 0.1347 |
| Terchloride of Arsenic | | | 14 to 98 | | 0.1760 | 159 to 268 | 0.1122 |
| Bichloride of Tin | | | 14 to 98 | | 0.1475 | 149 to 273 | 0.0939 |
| Bichloride of Titanium | | | 12 to 98 | | 0.1880 | 162 to 272 | 0.1290 |

# TABLE

## OF SPECIFIC HEATS OF THE MOST COMMON GASES AND VAPORS.

*The quantity of heat necessary to raise* 1 *gramme of water from* 0° *to* 1° *being unity.*

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. pp. 308, 313, 318.

| Name. | Equal Weights. | Equal Volumes. | Density. |
|---|---|---|---|
| Oxygen | 0.21751 | 0 24049 | 1.10560 |
| Nitrogen | 0.24380 | 0.23680 | 0.97130 |
| Hydrogen | 3.40900 | 0.23590 | 0.06920 |
| Chlorine | 0.12099 | 0.29645 | 2.45020 |
| Bromine vapor | 0.05552 | 0.30400 | 5.47720 |
| Deutoxide of Nitrogen | 0.23170 | 0.24060 | 1.03840 |
| Carbonic oxide | 0.24500 | 0.23700 | 0.96730 |
| Hydrochloric Acid | 0.18520 | 0.23330 | 1.25960 |
| Carbonic Acid | 0.21690 | 0.33070 | 1.52010 |
| Protoxide of Nitrogen | 0.22620 | 0.34470 | 1.52410 |
| Vapor of Water | 0.48050 | 0.29890 | 0.62190 |
| Sulphurous Acid | 0.15440 | 0.34140 | 2.21130 |
| Hydrosulphuric Acid | 0.24320 | 0.28570 | 1.17470 |
| Bisulphide of Carbon | 0.15690 | 0.41220 | 2.62580 |
| Protocarburetted Hydrogen | 0.59290 | 0.32770 | 0.55270 |
| Chloroform | 0.15670 | 0.64610 | 4.12440 |
| Bicarburetted Hydrogen | 0.40400 | 0.41600 | 0.96720 |
| Ammonia | 0.50840 | 0.29960 | 0.58940 |
| Benzine | 0.37540 | 1.01140 | 2.69420 |
| Essence of Turpentine | 0.50610 | 2.37760 | 4.69780 |
| Wood Spirit | 0.45800 | 0.50630 | 1.10550 |
| Ether | 0.47970 | 1.22660 | 2.55730 |
| Sulphide of Ethyl | 0.40080 | 1.24660 | 3.11010 |
| Chloride " | 0.27380 | 0.60960 | 2.22690 |
| Bromide " | 0.18960 | 0.70260 | 3.70580 |
| Dutch liquid | 0.22930 | 0.78360 | 3.41740 |
| Acetone | 0.41250 | 0.82640 | 2.00360 |
| Acetate of Ethyl | 0.40080 | 1.21840 | 3.04000 |
| Chloride of Silicium | 0.13220 | 0.77780 | 5.88330 |
| Terchloride of Phosphorus | 0.13470 | 0.63950 | 4.74640 |
| " Arsenic | 0.11220 | 0.70340 | 6.26670 |
| Bichloride of Titanium | 0.12900 | 0.85640 | 6.64020 |
| " Tin | 0.09390 | 0.84160 | 8.96540 |

## SPECIFIC HEAT OF WATER AND LATENT HEAT OF THE VAPOR OF WATER.

REGNAULT. — Mémoires de l'Académie de France, Tome XXI. p. 748.

| Temperature measured by the Air Thermometer. T. | Number of units of Heat lost by one Kilogramme of Water in passing from T° to 0°. Q. | Mean Specific Heat of Water between 0° and T°. | Specific Heat of Water from T° to T°+dT° $\frac{dQ}{dT}$ | Latent Heat of the saturated Vapor at the Temperature T. | Total Heat. |
|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 1.0000 | 606.5 | 0.0 |
| 10 | 10.002 | 1.0002 | 1.0005 | 599.5 | 609.5 |
| 20 | 20.010 | 1.0005 | 1.0012 | 592.6 | 612.6 |
| 30 | 30.026 | 1.0009 | 1.0020 | 585.7 | 615.7 |
| 40 | 40.051 | 1.0013 | 1.0030 | 578.7 | 618.7 |
| 50 | 50.087 | 1.0017 | 1.0042 | 571.6 | 621.7 |
| 60 | 60.137 | 1.0023 | 1.0056 | 564.7 | 624.8 |
| 70 | 70.210 | 1.0030 | 1.0072 | 557.6 | 627.8 |
| 80 | 80.282 | 1.0035 | 1.0089 | 550.6 | 630.9 |
| 90 | 90.381 | 1.0042 | 1.0109 | 543.5 | 633.9 |
| 100 | 100.500 | 1.0050 | 1.0130 | 536.5 | 637.0 |
| 110 | 110.641 | 1.0058 | 1.0153 | 529.4 | 640.0 |
| 120 | 120.806 | 1.0067 | 1.0177 | 522.3 | 643.1 |
| 130 | 130.997 | 1.0076 | 1.0204 | 515.1 | 646.1 |
| 140 | 141.215 | 1.0087 | 1.0232 | 508.0 | 649.2 |
| 150 | 151.462 | 1.0097 | 1.0262 | 500.7 | 652.2 |
| 160 | 161.741 | 1.0109 | 1.0294 | 493.6 | 655.3 |
| 170 | 172.052 | 1.0121 | 1.0328 | 486.2 | 658.3 |
| 180 | 182.398 | 1.0133 | 1.0364 | 479.0 | 661.4 |
| 190 | 192.779 | 1.0146 | 1.0401 | 471.6 | 664.4 |
| 200 | 203.200 | 1.0160 | 1.0440 | 464.3 | 667.5 |
| 210 | 213.660 | 1.0174 | 1.0481 | 456.8 | 670.5 |
| 220 | 224.162 | 1.0189 | 1.0524 | 449.4 | 673.6 |
| 230 | 234.708 | 1.0204 | 1.0568 | 441.9 | 676.6 |

## TOTAL HEAT OF VAPORIZATION OF DIFFERENT LIQUIDS.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 918.

| Substance. | °C. | Substance. | °C. |
|---|---|---|---|
| Amylic Alcohol | 211.78 | Acetate of Ethyl | 154.49 |
| Turpentine | 139.15 | Bisulphide of Carbon | 96.80 |
| Essence of Citron | 160.49 | Alcohol | 265.50 |
| Petroleum | 194.87 | Ether | 109.12 |
| Chloride of Ethyl | 97.70 | Benzine | 127.40 |
| Iodide of Ethyl | 58.95 | Chloroform | 76.33 |
| Bromine | 50.95 | Chloride of Carbon ($CCl_2$) | 62.30 |
| Bichloride of tin | 46.84 | Acetone | 153.65 |
| Terchloride of Arsenic | 69.74 | Water | 636.70 |
| Terchloride of Phosphorus | 67.24 | | |

# TABLE

## OF THE LINEAR EXPANSION OF VARIOUS SOLID BODIES BETWEEN 0° AND 100° C.

| Substance. | Expansion. | Observer. |
|---|---|---|
| Lead | 0.00284836 | Lavoisier. |
| " | 0.00271900 | Guyton de Morveau. |
| " | 0.00286667 | Smeaton. |
| " | 0.00300500 | Calvert and Johnson. |
| Iron, Wrought | 0.00122045 | Lavoisier and Laplace. |
| " " | 0.00118203 | Dulong and Petit. |
| " " | 0.00125833 | Smeaton. |
| " " | 0.00118700 | Calvert and Johnson. |
| Iron, Wire | 0.00123504 | Lavoisier. |
| " " | 0.00114010 | Borda. |
| Iron, Cast | 0.00111700 | Calvert and Johnson. |
| " " | 0.00110940 | Roy. |
| Glass, English flint | 0.00081166 | Lavoisier. |
| " French " | 0.00087199 | " |
| " Soft | 0.00086100 | Dulong and Petit. |
| " " | 0.00083333 | Smeaton. |
| " Tube | 0.00077615 | Roy. |
| " " free from Lead | 0.00087572 | Lavoisier. |
| " " " " " | 0.00091751 | " |
| " Rod | 0.00080787 | Roy. |
| Gold, Fine | 0.00146606 | Lavoisier. |
| " Paris test unannealed | 0.00155155 | " |
| " " " annealed | 0.00151361 | " |
| " | 0.00147500 | Guyton de Morveau. |
| " | 0.00140100 | Ellicot. |
| " | 0.00137400 | Calvert and Johnson. |
| Copper | 0.00171000 | Ellicot. |
| " Hammered | 0.00172244 | Lavoisier. |
| " " | 0.00176900 | Calvert and Johnson. |
| " | 0.00171222 | Lavoisier. |
| " | 0.00171822 | Dulong and Petit. |
| " Cast | 0.00187900 | Calvert and Johnson. |
| Brass | 0.00193332 | Smeaton. |

| Substance. | Expansion. | Observer. |
|---|---|---|
| Brass Wire | 0.00187821 | Lavoisier. |
| " " | 0.00188500 | Herbert. |
| " Hammered | 0.00182800 | Calvert and Johnson. |
| " Cast | 0.00186671 | Lavoisier. |
| " " | 0.00193000 | Calvert and Johnson. |
| " | 0.00187500 | Smeaton. |
| Palladium | 0.00100000 | Wollaston. |
| Platinum | 0.00088417 | Dulong and Petit. |
| " | 0.00090000 | Wollaston. |
| " | 0.00085700 | Guyton de Morveau. |
| " | 0.00088100 | Calvert and Johnson. |
| Silver, Cupeled | 0.00190974 | Lavoisier. |
| " | 0.00198800 | Guyton de Morveau. |
| " | 0.00208260 | Troughton. |
| " Cast | 0.00199100 | Calvert and Johnson. |
| Steel, Soft | 0.00107875 | Lavoisier. |
| " " | 0.00115000 | Smeaton. |
| " " | 0.00103800 | Calvert and Johnson. |
| " Tempered | 0.00140200 | " " |
| " " | 0.00136900 | Lavoisier. |
| " Rod | 0.00114470 | Roy. |
| Bismuth | 0.00139167 | Smeaton. |
| " | 0.00134100 | Calvert and Johnson. |
| Zinc, Cast | 0.00294167 | Smeaton. |
| " " | 0.00305100 | Guyton de Morveau. |
| " Hammered | 0.00310833 | Smeaton. |
| " " | 0.00219300 | Calvert and Johnson. |
| Tin, Fine | 0.00216400 | Guyton de Morveau. |
| " | 0.00209300 | Herbert. |
| " | 0.00271700 | Calvert and Johnson. |
| " Malacca | 0.00193765 | Lavoisier. |
| " Common | 0.00248330 | Smeaton. |
| Bronze | 0.00181667 | " |
| Alloy 1 Zn 2 Cu | 0.00205833 | " |
| Calc-spar in the Chief Axis | 0.00286000 | Mitscherlich. |
| Coal from Oak Wood | 0.00120000 | P. Henrich. |
| " " Fir " | 0.00100000 | " |
| Marble from Carrara | 0.00084870 | Destigny. |
| " " St. Beat | 0.00041810 | " |
| Phosphorus from 0 – 39.50° | 0.00142455 | Erman. |
| Aluminum | 0.00221800 | Calvert and Johnson. |
| Cadmium | 0.00332300 | " " |
| Antimony, Hammered | 0.00098500 | " " |
| Speculum Metal | 0.00193333 | Smeaton. |
| Antimony | 0.00108330 | " |
| Solder, Soft | 0.00250533 | " |

# TABLE

## OF THE CUBICAL EXPANSION OF DIFFERENT SOLID BODIES FOR EACH INCREASE OF 1° C. OF TEMPERATURE.

KOPP. — Annalen der Chemie und Pharmacie, LXXXI. 65.

| Name of Substance. | Formula. | Coefficient of Expansion. |
|---|---|---|
| Antimony | $Sb$ | 0.000033 |
| Bismuth | $Bi$ | 0.000040 |
| Cadmium | $Cd$ | 0.000094 |
| Copper | $Cu$ | 0.000051 |
| Iron | $Fe$ | 0.000037 |
| Lead | $Pb$ | 0.000089 |
| Sulphur | $S$ | 0.000183 |
| Tin | $Sn$ | 0.000069 |
| Zinc | $Zn$ | 0.000089 |
| Barium, Sulphate | $BaO, SO_3$ | 0.000058 |
| Arragonite | $CaO, CO_2$ | 0.000065 |
| Dolomite | $CaO, CO_2 + MgO, CO_2$ | 0.000035 |
| Strontium, Sulphate | $SrO, SO_3$ | 0.000061 |
| Specular Iron Ore | $Fe_2O_3$ | 0.000040 |
| Iron Pyrites | $FeS_2$ | 0.000034 |
| Carbonate of Iron, Manganese, and Magnesia | $Fe(Mg, Mn)O, CO_2$ | 0.000035 |
| Fluor Spar | $CaF$ | 0.000062 |
| Carbonate of Lime, Calc-spar | $CaO, CO_2$ | 0.000018 |
| Magnetic Iron Ore | $Fe_3O_4$ | 0.000029 |
| Orthoclase | $KO, SiO_3 +$ | 0.000026 |
| | $Al_2O_3, 3SiO_2$ | 0.000017 |
| Quartz | $SiO_2$ | 0.000042 |
| | | 0.000039 |
| Rutile | $TiO_2$ | 0.000032 |
| Tin Stone | $SnO_2$ | 0.000016 |
| Zinc Blende | $ZnS$ | 0.000036 |
| Hard Potash Glass | | 0.000021 |
| Soft Soda Glass | | 0.000026 |
| " " " another kind | | 0.000024 |
| Galena | $PbS$ | 0.000068 |

# TABLE

## OF THE VOLUME OF A GLASS VESSEL WHEN ITS VOLUME AT 15° C. IS TAKEN AS UNITY.

GERLACH'S Salzlösungen, p. 115.

| | VOLUME AT | | |
|---|---|---|---|
| °C. | | °C. | |
| 0 | 0.99961210 | 23 | 1.00020688 |
| 1 | 0.99963796 | 24 | 1.00023274 |
| 2 | 0.99966382 | 25 | 1.00025860 |
| 3 | 0.99968968 | 26 | 1.00028446 |
| 4 | 0.99971554 | 27 | 1.00031032 |
| 5 | 0.99974140 | 28 | 1.00033618 |
| 6 | 0.99976726 | 29 | 1.00036204 |
| 7 | 0.99979313 | 30 | 1.00038790 |
| 8 | 0.99981898 | 35 | 1.00051720 |
| 9 | 0.99984484 | 40 | 1.00064650 |
| 10 | 0.99987070 | 45 | 1.00077580 |
| 11 | 0.99989656 | 50 | 1.00090510 |
| 12 | 0.99992242 | 55 | 1.00103440 |
| 13 | 0.99994828 | 60 | 1.00116370 |
| 14 | 0.99997414 | 65 | 1.00129300 |
| 15 | 1.00000000 | 70 | 1.00142230 |
| 16 | 1.00002586 | 75 | 1.00155160 |
| 17 | 1.00005172 | 80 | 1.00168090 |
| 18 | 1.00007758 | 85 | 1.00181020 |
| 19 | 1.00010344 | 90 | 1.00193950 |
| 20 | 1.00012930 | 95 | 1.00206880 |
| 21 | 1.00015516 | 100 | 1.00219810 |
| 22 | 1.00018102 | | |

# TABLE

## OF THE EXPANSION OF GLASS.

*Calculated from Regnault's data.*

JAS T. BROWN.—Jour. Chem. Society, N. S. IV. p. 80.

| $t' - t$ | $1 + k(t' - t)$ | $t' - t$ | $1 + k(t' - t)$ | $t' - t$ | $1 + k(t' - t)$ |
|---|---|---|---|---|---|
| 35 | 1.00096 | 145 | 1.00421 | 250 | 1.00765 |
| 40 | 1.00110 | 150 | 1.00436 | 255 | 1.00780 |
| 45 | 1.00124 | 155 | 1.00451 | 260 | 1.00795 |
| 50 | 1.00138 | 160 | 1.00465 | 265 | 1.00810 |
| 55 | 1.00151 | 165 | 1.00480 | 270 | 1.00826 |
| 60 | 1.00165 | 170 | 1.00494 | 275 | 1.00841 |
| 65 | 1.00179 | 175 | 1.00509 | 280 | 1.00856 |
| 70 | 1.00193 | 180 | 1.00523 | 285 | 1.00892 |
| 75 | 1.00207 | 185 | 1.00551 | 290 | 1.00907 |
| 80 | 1.00220 | 190 | 1.00566 | 295 | 1.00923 |
| 85 | 1.00241 | 195 | 1.00581 | 300 | 1.00939 |
| 90 | 1.00255 | 200 | 1.00596 | 305 | 1.00954 |
| 95 | 1.00269 | 205 | 1.00610 | 310 | 1.00970 |
| 100 | 1.00284 | 210 | 1.00625 | 315 | 1.00985 |
| 105 | 1.00298 | 215 | 1.00640 | 320 | 1.01001 |
| 110 | 1.00312 | 220 | 1.00655 | 325 | 1.01017 |
| 115 | 1.00326 | 225 | 1.00670 | 330 | 1.01032 |
| 120 | 1.00340 | 230 | 1.00685 | 335 | 1.01048 |
| 125 | 1.00355 | 235 | 1.00719 | 340 | 1.01064 |
| 130 | 1.00369 | 240 | 1.00734 | 345 | 1.01079 |
| 135 | 1.00392 | 245 | 1.00749 | 350 | 1.01095 |
| 140 | 1.00407 | | | | |

# TABLE

## OF THE ABSOLUTE DILATATION OF MERCURY.

REGNAULT. — Mémoires de l'Académie de France, Tome XXI. p. 328.

| Temperature by Air Thermometer. T. | Dilatation of Mercury from 0° to T. $\delta_T$ | Mean Coefficient of Dilatation from 0° to T. $\delta$ | Real Coefficient of Dilatation at T. $\frac{d\,\delta_T}{d\,T}$ | Temperature deduced from the absolute Dilatation of Mercury. $\theta$ | Difference between Thermometer based on the absolute Dilatation of Mercury and the Air Thermometer. $(\theta - T.)$ |
|---|---|---|---|---|---|
| ° | | | | ° | ° |
| 0 | 0.000000 | 0.00000000 | 0.00017905 | 0.000 | 0.000 |
| 10 | 0.001792 | 0.00017925 | 0.00017950 | 9.872 | —0.128 |
| 20 | 0.003590 | 0.00017951 | 0.00018001 | 19.776 | —0.224 |
| 30 | 0.005393 | 0.00017976 | 0.00018051 | 29.709 | —0.291 |
| 40 | 0.007201 | 0.00018002 | 0.00018102 | 39.668 | —0.332 |
| 50 | 0.009013 | 0.00018027 | 0.00018152 | 49.650 | —0.350 |
| 60 | 0.010831 | 0.00018052 | 0.00018203 | 59.665 | —0.335 |
| 70 | 0.012655 | 0.00018078 | 0.00018253 | 69.713 | —0.287 |
| 80 | 0.014482 | 0.00018102 | 0.00018304 | 79.777 | —0.223 |
| 90 | 0.016315 | 0.00018128 | 0.00018354 | 89.875 | —0.125 |
| 100 | 0.018153 | 0.00018153 | 0.00018405 | 100.000 | 0.000 |
| 110 | 0.019996 | 0.00018178 | 0.00018455 | 110.153 | +0.153 |
| 120 | 0.021844 | 0.00018203 | 0.00018505 | 120.333 | 0.333 |
| 130 | 0.023697 | 0.00018228 | 0.00018556 | 130.540 | 0.540 |
| 140 | 0.025555 | 0.00018254 | 0.00018606 | 140.776 | 0.776 |
| 150 | 0.027419 | 0.00018279 | 0.00018657 | 151.044 | 1.044 |
| 160 | 0.029287 | 0.00018304 | 0.00018707 | 161.334 | 1.334 |
| 170 | 0.031160 | 0.00018329 | 0.00018758 | 171.652 | 1.652 |
| 180 | 0.033039 | 0.00018355 | 0.00018808 | 182.003 | 2.003 |
| 190 | 0.034922 | 0.00018380 | 0.00018859 | 192.376 | 2.376 |
| 200 | 0.036811 | 0.00018405 | 0.00018909 | 202.782 | 2.782 |
| 210 | 0.038704 | 0.00018430 | 0.00018959 | 213.210 | 3.210 |
| 220 | 0.040603 | 0.00018456 | 0.00019010 | 223.671 | 3.671 |
| 230 | 0.042506 | 0.00018481 | 0.00019061 | 234.154 | 4.154 |
| 240 | 0.044415 | 0.00018506 | 0.00019111 | 244.670 | 4.670 |
| 250 | 0.046329 | 0.00018531 | 0.00019161 | 255.214 | 5.214 |
| 260 | 0.048247 | 0.00018557 | 0.00019212 | 265.780 | 5.780 |
| 270 | 0.050171 | 0.00018582 | 0.00019262 | 276.379 | 6.379 |
| 280 | 0.052100 | 0.00018607 | 0.00019313 | 287.005 | 7.005 |
| 290 | 0.054034 | 0.00018632 | 0.00019363 | 297.659 | 7.659 |
| 300 | 0.055973 | 0.00018658 | 0.00019413 | 308.340 | 8.340 |
| 310 | 0.057917 | 0.00018683 | 0.00019464 | 319.048 | 9.048 |
| 320 | 0.059866 | 0.00018708 | 0.00019515 | 329.786 | 9.786 |
| 330 | 0.061820 | 0.00018733 | 0.00019565 | 340.550 | 10.550 |
| 340 | 0.063778 | 0.00018758 | 0.00019616 | 351.336 | 11.336 |
| 350 | 0.065743 | 0.00018784 | 0.00019666 | 362.160 | 12.160 |

# TABLE

## COMPARING AIR AND MERCURY THERMOMETERS MADE OF DIFFERENT KINDS OF GLASS.

REGNAULT. — Mémoires de l'Académie de France, Tome XXI. p. 239.

| Temperature of Air Thermometer. | Temperatures of Mercurial Thermometers. | | | |
|---|---|---|---|---|
| | Crystal from Choisy-le-Roi. | Common Glass. | Green Glass. | Hard Swedish Glass. |
| 100° | 100°.00 | 100°.00 | 100°.00 | 100°.00 |
| 110 | 110.05 | 109.98 | 110.03 | 110.02 |
| 120 | 120.12 | 119.95 | 120.08 | 120.04 |
| 130 | 130.20 | 129.91 | 130.14 | 130.07 |
| 140 | 140.29 | 139.85 | 140.21 | 140.11 |
| 150 | 150.40 | 149.80 | 150.30 | 150.15 |
| 160 | 160.52 | 159.74 | 160.40 | 160.20 |
| 170 | 170.65 | 169.68 | 170.50 | 170.26 |
| 180 | 180.80 | 179.63 | 180.60 | 180.33 |
| 190 | 191.01 | 189.65 | 190.70 | 190.41 |
| 200 | 201.25 | 199.70 | 200.80 | 200.50 |
| 210 | 211.53 | 209.75 | 211.00 | 210.61 |
| 220 | 221.82 | 219.80 | 221.20 | 220.75 |
| 230 | 232.16 | 229.85 | 231.42 | 230.91 |
| 240 | 242.55 | 239.90 | 241.60 | 241.16 |
| 250 | 253.00 | 250.05 | 251.85 | 251.44 |
| 260 | 263.44 | 260.20 | 262.15 | |
| 270 | 273.90 | 270.38 | 272.50 | |
| 280 | 284.48 | 280.52 | 282.85 | |
| 290 | 295.10 | 290.80 | 293.30 | |
| 300 | 305.72 | 301.08 | | |
| 310 | 316.45 | 311.45 | | |
| 320 | 327.25 | 321.80 | | |
| 330 | 338.22 | 332.40 | | |
| 340 | 349.30 | 343.00 | | |
| 350 | 360.50 | 354.00 | | |

# TABLE

## FOR COMPARISON OF CENTIGRADE AND FAHRENHEIT THERMOMETER SCALES.

| Centigrade. | Fahrenheit. | Centigrade. | Fahrenheit. | Centigrade. | Fahrenheit. | Centigrade. | Fahrenheit. |
|---|---|---|---|---|---|---|---|
| +100 | +212.0 | +64 | +147.2 | +29 | +84.2 | — 6 | +21.2 |
| 99 | 210.2 | 63 | 145.4 | 28 | 82.4 | 7 | 19.4 |
| 98 | 208.4 | 62 | 143.6 | 27 | 80.6 | 8 | 17.6 |
| 97 | 206.6 | 61 | 141.8 | 26 | 78.8 | 9 | 15.8 |
| 96 | 204.8 | 60 | 140.0 | 25 | 77.0 | 10 | 14.0 |
| 95 | 203.0 | 59 | 138.2 | 24 | 75.2 | 11 | 12.2 |
| 94 | 201.2 | 58 | 136.4 | 23 | 73.4 | 12 | 10.4 |
| 93 | 199.4 | 57 | 134.6 | 22 | 71.6 | 13 | 8.6 |
| 92 | 197.6 | 56 | 132.8 | 21 | 69.8 | 14 | 6.8 |
| 91 | 195.8 | 55 | 131.0 | 20 | 68.0 | 15 | 5.0 |
| 90 | 194.0 | 54 | 129.2 | 19 | 66.2 | 16 | 3.2 |
| 89 | 192.2 | 53 | 127.4 | 18 | 64.4 | 17 | + 1.4 |
| 88 | 190.4 | 52 | 125.6 | 17 | 62.6 | 18 | — 0.4 |
| 87 | 188.6 | 51 | 123.8 | 16 | 60.8 | 19 | 2.2 |
| 86 | 186.8 | 50 | 122.0 | 15 | 59.0 | 20 | 4.0 |
| 85 | 185.0 | 49 | 120.2 | 14 | 57.2 | 21 | 5.8 |
| 84 | 183.2 | 48 | 118.4 | 13 | 55.4 | 22 | 7.6 |
| 83 | 181.4 | 47 | 116.6 | 12 | 53.6 | 23 | 9.4 |
| 82 | 179.6 | 46 | 114.8 | 11 | 51.8 | 24 | 11.2 |
| 81 | 177.8 | 45 | 113.0 | 10 | 50.0 | 25 | 13.0 |
| 80 | 176.0 | 44 | 111.2 | 9 | 48.2 | 26 | 14.8 |
| 79 | 174.2 | 43 | 109.4 | 8 | 46.4 | 27 | 16.6 |
| 78 | 172.4 | 42 | 107.6 | 7 | 44.6 | 28 | 18.4 |
| 77 | 170.6 | 41 | 105.8 | 6 | 42.8 | 29 | 20.2 |
| 76 | 168.8 | 40 | 104.0 | 5 | 41.0 | 30 | 22.0 |
| 75 | 167.0 | 39 | 102.2 | 4 | 39.2 | 31 | 23.8 |
| 74 | 165.2 | 38 | 100.4 | 3 | 37.4 | 32 | 25.6 |
| 73 | 163.4 | 37 | 98.6 | 2 | 35.6 | 33 | 27.4 |
| 72 | 161.6 | 36 | 96.8 | + 1 | 33.8 | 34 | 29.2 |
| 71 | 159.8 | 35 | 95.0 | 0 | 32.0 | 35 | 31.0 |
| 70 | 158.0 | 34 | 93.2 | — 1 | 30.2 | 36 | 32.8 |
| 69 | 156.2 | 33 | 91.4 | 2 | 28.4 | 37 | 34.6 |
| 68 | 154.4 | 32 | 89.6 | 3 | 26.6 | 38 | 36.4 |
| 67 | 152.6 | 31 | 87.8 | 4 | 24.8 | 39 | 38.2 |
| 66 | 150.8 | +30 | + 86.0 | — 5 | +23.0 | —40 | —40.0 |
| +65 | +149.0 | | | | | | |

# TABLE

## FOR THE COMPARISON OF THE FAHRENHEIT AND CENTIGRADE THERMOMETER SCALES.

| Fahrenheit. | Centigrade. | Fahrenheit. | Centigrade. | Fahrenheit. | Centigrade. |
|---|---|---|---|---|---|
| +212 | +100.00 | +174 | +78.89 | +136 | +57.78 |
| 211 | 99.44 | 173 | 78.33 | 135 | 57.22 |
| 210 | 98.89 | 172 | 77.78 | 134 | 56.67 |
| 209 | 98.33 | 171 | 77.22 | 133 | 56.11 |
| 208 | 97.78 | 170 | 76.67 | 132 | 55.55 |
| 207 | 97.22 | 169 | 76.11 | 131 | 55.00 |
| 206 | 96.67 | 168 | 75.55 | 130 | 54.44 |
| 205 | 96.11 | 167 | 75.00 | 129 | 53.89 |
| 204 | 95.55 | 166 | 74.44 | 128 | 53.33 |
| 203 | 95.00 | 165 | 73.89 | 127 | 52.78 |
| 202 | 94.44 | 164 | 73.33 | 126 | 52.22 |
| 201 | 93.89 | 163 | 72.78 | 125 | 51.67 |
| 200 | 93.33 | 162 | 72.22 | 124 | 51.11 |
| 199 | 92.78 | 161 | 71.67 | 123 | 50.55 |
| 198 | 92.22 | 160 | 71.11 | 122 | 50.00 |
| 197 | 91.67 | 159 | 70.55 | 121 | 49.44 |
| 196 | 91.11 | 158 | 70.00 | 120 | 48.89 |
| 195 | 90.55 | 157 | 69.44 | 119 | 48.33 |
| 194 | 90.00 | 156 | 68.89 | 118 | 47.78 |
| 193 | 89.44 | 155 | 68.33 | 117 | 47.22 |
| 192 | 88.89 | 154 | 67.78 | 116 | 46.67 |
| 191 | 88.33 | 153 | 67.22 | 115 | 46.11 |
| 190 | 87.78 | 152 | 66.67 | 114 | 45.55 |
| 189 | 87.22 | 151 | 66.11 | 113 | 45.00 |
| 188 | 86.67 | 150 | 65.55 | 112 | 44.44 |
| 187 | 86.11 | 149 | 65.00 | 111 | 43.89 |
| 186 | 85.55 | 148 | 64.44 | 110 | 43.33 |
| 155 | 85.00 | 147 | 63.89 | 109 | 42.78 |
| 184 | 84.44 | 146 | 63.33 | 108 | 42.22 |
| 183 | 83.89 | 145 | 62.78 | 107 | 41.67 |
| 182 | 83.33 | 144 | 62.22 | 106 | 41.11 |
| 181 | 82.78 | 143 | 61.67 | 105 | 40.55 |
| 180 | 82.22 | 142 | 61.11 | 104 | 40.00 |
| 179 | 81.67 | 141 | 60.55 | 103 | 39.44 |
| 178 | 81.11 | 140 | 60.00 | 102 | 38.89 |
| 177 | 80.55 | 139 | 59.44 | 101 | 38.33 |
| 176 | 80.00 | 138 | 58.89 | 100 | 37.78 |
| +175 | + 79.44 | +137 | +58.33 | + 99 | +37.22 |

| Fahrenheit. | Centigrade. | Fahrenheit. | Centigrade. | Fahrenheit. | Centigrade. |
|---|---|---|---|---|---|
| +98 | +36.67 | +51 | +10.55 | + 5 | —15.00 |
| 97 | 36.11 | 50 | 10.00 | 4 | 15.55 |
| 96 | 35.55 | 49 | 9.44 | 3 | 16.11 |
| 95 | 35.00 | 48 | 8.89 | 2 | 16.67 |
| 94 | 34.44 | 47 | 8.33 | + 1 | 17.22 |
| 93 | 33.89 | 46 | 7.78 | 0 | 17.78 |
| 92 | 33.33 | 45 | 7.22 | — 1 | 18.33 |
| 91 | 32.78 | 44 | 6.67 | 2 | 18.89 |
| 90 | 32.22 | 43 | 6.11 | 3 | 19.44 |
| 89 | 31.67 | 42 | 5.55 | 4 | 20.00 |
| 88 | 31.11 | 41 | 5.00 | 5 | 20.55 |
| 87 | 30.55 | 40 | 4.44 | 6 | 21.11 |
| 86 | 30.00 | 39 | 3.89 | 7 | 21.67 |
| 85 | 29.44 | 38 | 3.33 | 8 | 22.22 |
| 84 | 28.89 | 37 | 2.78 | 9 | 22.78 |
| 83 | 28.33 | 36 | 2.22 | 10 | 23.33 |
| 82 | 27.78 | 35 | 1.67 | 11 | 23.89 |
| 81 | 27.22 | 34 | 1.11 | 12 | 24.44 |
| 80 | 26.67 | 33 | + 0.55 | 13 | 25.00 |
| 79 | 26.11 | 32 | 0.00 | 14 | 25.55 |
| 78 | 25.55 | 31 | — 0.55 | 15 | 26.11 |
| 77 | 25.00 | 30 | 1.11 | 16 | 26.67 |
| 76 | 24.44 | 29 | 1.67 | 17 | 27.22 |
| 75 | 23.89 | 28 | 2.22 | 18 | 27.78 |
| 74 | 23.33 | 27 | 2.78 | 19 | 28.33 |
| 73 | 22.78 | 26 | 3.33 | 20 | 28.89 |
| 72 | 22.22 | 25 | 3.89 | 21 | 29.44 |
| 71 | 21.67 | 24 | 4.44 | 22 | 30.00 |
| 70 | 21.11 | 23 | 5.00 | 23 | 30.55 |
| 69 | 20.55 | 22 | 5.55 | 24 | 31.11 |
| 68 | 20.00 | 21 | 6.11 | 25 | 31.67 |
| 67 | 19.44 | 20 | 6.67 | 26 | 32.22 |
| 66 | 18.89 | 19 | 7.22 | 27 | 32.78 |
| 65 | 18.33 | 18 | 7.78 | 28 | 33.33 |
| 64 | 17.78 | 17 | 8.33 | 29 | 33.89 |
| 63 | 17.22 | 16 | 8.89 | 30 | 34.44 |
| 62 | 16.67 | 15 | 9.44 | 31 | 35.00 |
| 61 | 16.11 | 14 | 10.00 | 32 | 35.55 |
| 60 | 15.55 | 13 | 10.55 | 33 | 36.11 |
| 59 | 15.00 | 12 | 11.11 | 34 | 36.67 |
| 58 | 14.44 | 11 | 11.67 | 35 | 37.22 |
| 57 | 13.89 | 10 | 12.22 | 36 | 37.78 |
| 56 | 13.33 | 9 | 12.78 | 37 | 38.33 |
| 55 | 12.78 | 8 | 13.33 | 38 | 38.89 |
| 54 | 12.22 | 7 | 13.89 | 39 | 39.44 |
| 53 | 11.67 | + 6 | —14.44 | —40 | —40.00 |
| +52 | +11.11 | | | | |

*General Formula,* $V = 1 \pm At \pm Bt^2 \pm Ct^3$ *in which* $V$ *= the Volume at any Temperature* $t$*, the Volume at 0° being unity.*

**PIERRE. — Annales de Chemie et de Physique, 3 série, Tomes XV. p. 325, XIX. p. 198, XX. p. 5, XXI. p. 336, XXXI. p. 118, XXXIII. p. 199.**

| Name. | Formula. | Boiling Point at 760 mm. | A | B | C | Specific Gravity at 0°. | Remarks. |
|---|---|---|---|---|---|---|---|
| | | °C | | 0.0000 | 0.00000 | | |
| Alcohol | $C_4H_6O_2$ | 78.3 | +.001048630 | +017509900 | +000134518 | 0.81510 | |
| Wood Spirit | $C_2H_4O_2$ | 66.3 | .001185569 | 015649300 | 000911100 | 0.82074 | |
| Bisulphide of Carbon | $CS_2$ | 48.0 | .001139800 | 013706500 | 001912200 | 1.29310 | |
| Ether | $C_8H_{10}O_2$ | 35.7 | .001513240 | 023590000 | 004005100 | 0.73580 | |
| Chloride of Ethyl | $C_8H_{10}Cl_2$ | 11.0 | .001574578 | 028136000 | 001569870 | 0.92116 | |
| Bromide of Ethyl | $C_8H_{10}Br_2$ | 40.8 | .001337600 | 015013480 | 001690000 | 1.47329 | |
| Iodide of Ethyl | $C_8H_{10}I_2$ | 70.3 | .001142250 | 019638000 | 000620640 | 1.97540 | |
| Bromide of Methyl | $C_4H_6Br_2$ | 13.0 | .001415200 | 033152810 | 011380900 | 1.66440 | |
| Iodide of Methyl | $C_4H_6I_2$ | 44.1 | .001199590 | 021633180 | 001005000 | 2.19920 | |
| Formate of Ethyl | $C_6H_6O_4$ | 53.2 | .001325200 | 028624840 | 000661800 | 0.93560 | |
| Acetate of Methyl | $C_6H_6O_4$ | 59.5 | .001295950 | 029098000 | 000425690 | 0.86680 | |
| Fusel Oil | $C_{10}H_{12}O_2$ | 132.1 | .000890100 | 006572900 | 001184580 | 0.82705 | — 15° to + 80° |
| | | | .008988500 | 006874460 | 001009600 | | + 80° to + 132°.1 |
| Acetate of Ethyl | $C_8H_8O_4$ | 74.0 | .001258490 | 029568800 | 001492150 | 0.90691 | |
| Butyrate of Methyl | $C_{10}H_{10}O_4$ | 102.7 | .001239890 | 006260240 | 001306500 | 1.02928 | |
| " " Ethyl | $C_{12}H_{12}O_4$ | 119.4 | .001202790 | 000722338 | 002263460 | 0.90190 | 13° to 99° |
| | | | .000632742 | 127630000 | 005027800 | | 99° to 119°.4 |
| Chloride of Phosphorus | $PCl_3$ | 78.74 | .001128600 | 008728800 | 1792300000 | 1.61616 | |
| Bromide of Phosphorus | $PBr_3$ | 175.3 | .000847200 | 004367000 | 000252700 | 2.92489 | 0° to 100° |
| | | | .000824268 | 009143000 | 000005500 | | 100° to 175°.3 |
| Chloride of Arsenic | $AsCl_3$ | 133.91 | .000979072 | 009669000 | 000177700 | 2.20495 | |
| Bichloride of Tin | $SnCl_2$ | 115.7 | .001132800 | 009117100 | 000757900 | 2.26712 | |
| " " Titanium | $TiCl_2$ | 135.9 | +.000942569 | 013457900 | 000088800 | 1.76088 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Chloride of Silicon | $SiCl_2$ | 59.0 | +.001294100 | +021840000 | +004086400 | 1.52370 | Water at 4° |
| Bromide of Silicon | $SiBr_2$ | 153.26 | .000952570 | 007567000 | 000029200 | 2.81280 | = unity. |
| Chloride of Ethylene | $C_4H_4Cl_2$ | 84.92 | .001118900 | 010468600 | 001034100 | 1.28034 | melt'g pt. 20°.09 |
| Bromide of Ethylene | $C_4H_4Br_2$ | 132.8 | .000952690δ* | 013165000δ² | 0001062680δ³ | 2.16292 | 20°.09 to 100°.16 |
| | | | .001016760δ* | —001022300δ² | 0008788000δ³ | | 100°.16 to 132°.8 |
| Bromine | Br | 63.04 | .001038180 | 017113800 | 000544700 | 3.18700 | |
| Sulphurous Acid | $SO_2$ | —8.0 | .001496000δ | 223370000δ² | 049570000δ³ | 1.49110 | —25°.85 as unity. |
| Sulphite of Ethyl | $C_4H_5SO_3$ | 160.2 | .000993479 | 010903880 | 000153900 | 1.10634 | |
| Aldehyde | $C_4H_4O_2$ | 22.1 | .001653500 | 085060000 | 006425800 | 0.80551 | |
| Butyric Acid | $C_8H_8O_4$ | 163.4 | .001025700 | 008376000 | 000346900 | 0.98165 | 0° to 100° |
| | | | .001030400 | 008188900 | 000333200 | | 100° to 163°.4 |
| Chloride of Chlorethyl | $C_4H_4Cl_2$ | 65.0 | .001290700 | 001183340 | 002133900 | 1.24074 | |
| " " Chlorethylene | $C_4H_3Cl_3$ | 114.4 | .001056000 | 002803500 | 001508800 | 1.42200 | 0° to 75° |
| | | | .000952700 | 031950000 | +000641200 | | 75° to 114°.4 |
| Chloride of Bichlorethyl | $C_4H_3Cl_3$ | 75.0 | .001174800 | 035770000 | —000536700 | 1.34650 | |
| Bisulphide of Methyl | $C_2H_3S_2$ | 112.7 | .001017000 | 015760000 | +000190700 | 1.06358 | |
| Sulphocyanide of Methyl | $C_4H_3NS_2$ | 132.96 | .000970070 | 012540000 | +001175400 | 1.08794 | 0° to 70° |
| | | | .000948000 | 025479000 | —000246400 | | 70° to 132°.96 |
| Chloroform | $C_2HCl_3$ | 63.0 | .001107000 | 046647000 | —001743200 | 1.52520 | |
| Bichloride of Carbon | $C_2Cl_4$ | 78.6 | .001183800 | 008988000 | +001351300 | 1.62983 | |
| Sulphide of Ethyl | $C_6H_{10}S_2$ | 91.0 | .001196400 | 018065000 | 000788200 | 0.83672 | |
| Chloride of Amyl | $C_{10}H_{11}Cl$ | 102.0 | .001171500 | 005007700 | 001353684 | 0.89584 | |
| Bromide of Amyl | $C_{10}H_{11}Br$ | 118.6 | .001023000 | 019008600 | 000197500 | 1.16576 | 0° to 80° |
| | | | .001070900 | 008544500 | +000764000 | | 80° to 118°.6 |
| Chloride of Bichlorethylene | $C_4H_2Cl_4$ | 138.5 | .000835619 | 065877000 | —005414000 | 1.61158 | 0° to 60° |
| | | | .009771680 | 007347800 | +000401000 | | 60° to 138°.5 |
| " Trichlorethylene | $C_4HCl_4$ | 153.7 | .000899000 | 024577700 | —001286400 | 1.66267 | 0° to 75° |
| | | | .000973390 | 000257700 | +000636400 | | 75° to 153°.7 |
| Protochloride of Carbon | $C_4Cl_4$ | 123.9 | .001002600 | 003279800 | +001593390 | 1.64900 | 0° to 75° |
| | | | .000920800 | 034007450 | —001007500 | | 75° to 123°.9 |
| Terebene | $C_{20}H_{16}$ | 161.6 | .000896550 | 020366800 | 000748360 | 0.87179 | 0° to 80° |
| | | | +.000879250 | +018095000 | —000172600 | | 80° to 161°.6 |

* $\delta = t - t'$ $t'$ = the melting point or point taken as unity.

## EXPANSIONS AND BOILING-POINTS OF LIQUIDS.

*General Formula for the Expansion of Liquids,* $V = 1 \pm At^{\circ} \pm Bt^{\circ 2} \pm Ct^{\circ 3}$.

KOPP. — Annalen der Physik u. Chemie, LXXII. 1–223. Annalen der Chem. und Phar. XCIV. 257, XCV. 307, XCVIII. 367.

| Name. | Formula. | Boiling Point at 760 mm. | A | B | C | Specific Gravity at 0°. | Remarks. |
|---|---|---|---|---|---|---|---|
| | | °C | | 0.00000 | 0.000000 | | |
| Wood Spirit | $C_2H_4O_2$ | 65.8 | +.00113420 | +13635000 | +00874100 | 0.81420 | |
| Fusel Oil | $C_{10}H_{12}O_2$ | 132.2 | .00097240 | —08565100 | +02021800 | 0.82480 | |
| Valeraldehyde | $C_{10}H_{10}O_2$ | 93.6 | .00119360 | +29750000 | —00418070 | 0.82240 | |
| Anhydrous Acetic Acid | $C_4H_6O_3$ | 137.9 | .00105307 | +18389000 | +00079165 | 1.09690 | |
| Acetate of Amyl | $C_{14}H_{14}O_4$ | 137.9 | .00115010 | —00904600 | 01301500 | 0.88370 | |
| Valerate of Amyl | $C_{20}H_{20}O_4$ | 188.9 | .00103170 | +00832540 | 00768980 | 0.87930 | |
| Oxalate of Ethyl | $C_{12}H_{10}O_8$ | 186.1 | .00106880 | 08417000 | 00472550 | 1.10160 | |
| Salicylate of Methyl | $C_{16}H_8O_6$ | 223.7 | .00084360 | 04008200 | 00255050 | 1.19690 | |
| Benzoic Acid | $C_{14}H_6O_4$ | 249.9 | .00080370δ* | 12459000δ² | | 1.08380 | melts at 121°.4. |
| Benzoate of Methyl | $C_{16}H_8O_4$ | 199.7 | .00089390 | +08529000 | 00259360 | 1.10260 | |
| " " Ethyl | $C_{18}H_{10}O_4$ | 213.4 | .00093094 | —00634290 | 00499280 | 1.06570 | |
| " " Amyl | $C_{24}H_{16}O_4$ | 261.2 | .00082495 | +07303500 | 00128330 | 1.00390 | |
| Benzoic Alcohol | $C_{14}H_8O_2$ | 206.8 | .00078730 | +05129900 | 00272500 | 1.06280 | |
| Oil of Bitter Almonds | $C_{14}H_6O_2$ | 179.4 | .00094020 | —08204500 | 00806000 | 1.06360 | |
| Cuminol | $C_{20}H_{12}O_2$ | 237.0 | .00084150 | +02222000 | 00348430 | 0.98320 | |
| Cymol | $C_{10}H_{14}$ | 178.1 | .00094060 | 03808500 | 00486670 | 0.87780 | |
| Propionic Acid | $C_3H_6O_4$ | 141.8 | .00110030 | +02181600 | 00697960 | 1.01610 | |
| Valeric " | $C_{10}H_{10}O_4$ | 176.3 | .00104760 | —02400100 | +00824660 | 0.95550 | |
| Phenol | $C_{12}H_6O_2$ | 188.6 | .00067440 | +17210000 | —00050408 | 1.08080 | |
| Propionate of Ethyl | $C_{10}H_{10}O_4$ | 97.7 | .00128600 | 05138600 | +01730500 | 0.92310 | |
| Cinnamate " | $C_{22}H_{12}O_4$ | 266.6 | .00081090 | 06401600 | 00143760 | 1.06560 | |
| Oxalate of Methyl | $C_4H_6O_8$ | 161.1 | .00107900δ | 15554000δ² | | 1.15660 | melts at 50°. |
| Carbonate of Ethyl | $C_{10}H_{10}O_6$ | 126.4 | .00117110 | 05259600 | 00985210 | 0.99980 | |
| Succinate " | $C_{10}H_{14}O_8$ | 217.7 | .00100880 | 03328200 | 00517010 | 1.07180 | |

* δ = Number of degrees above melting point.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Naphthalin | $C_{20}H_8$ | 216.8 | +.00074700δ | +18095000δ² | | 0.97740 | melts at 79°.2 |
| Butyl | $C_{16}H_{18}$ | 109.0 | .00121250 | 02793000 | +01629700 | 0.71350 | |
| Chloride of Amyl | $C_{10}H_{11}Cl$ | 101.4 | | | | 0.88590 | |
| " Butyl | $C_8H_8Cl_2$ | 122.8 | .00092940 | 31403000 | —00492100 | 1.09530 | |
| " Acetyl | $C_4H_3O_2Cl_3$ | 56.0 | .00131540 | 38706000 | | 1.13050 | |
| " Benzoyl | $C_{14}H_5O_2Cl$ | 198.4 | .00085893 | 04421900 | +00271890 | 1.23240 | |
| Chloral | $C_4HCl_3O_2$ | 99.6 | .00095450 | 22139000 | 05639200 | 1.51830 | |
| Iodide of Amyl | $C_{10}H_{11}I$ | 148.4 | .00096500 | 12314000 | 00241110 | 1.46760 | |
| Amyl Mercaptan | $C_{10}H_{12}S_2$ | 120.1 | .00103250 | 17259000 | +00153180 | 0.85480 | |
| Chloride of Antimony | $SbCl_3$ | 223.5 | .00080540δ | 10330000δ² | | 2.67500 | melts at 73°.2 |
| Bromide " | $SbBr_3$ | 275.4 | .00057600δ | 13465000δ² | | 3.64100 | " 90°.0 |
| Chloride of Sulphur | $S_2Cl$ | 144.0 | .00095910 | 00381850 | +00731860 | 1.70550 | |
| Nitrate of Ethyl | $C_4H_5NO_6$ | 87.4 | .00112900 | 47915000 | —01841300 | 1.13220 | |
| Nitrobenzol | $C_{12}H_5NO_4$ | 220.2–221.1 | .00082630 | 05224900 | +00137790 | 1.20020 | |
| Aniline | $C_{12}H_7N$ | 185.6 | .00081730 | 09191000 | 00062784 | 1.03610 | |
| Cyanide of Methyl | $C_4H_3N$ | 71.4–72.6 | .00121180 | 17780000 | 01532200 | 0.83470 | |
| " " Phenyl | $C_{14}H_5N$ | 191.5 | .00093380 | 03072200 | 00579600 | 1.02300 | |
| Mustard Oil | $C_8H_5NS_2$ | 151.8 | .00107130 | 00327010 | 00735690 | 1.02820 | |
| Alcohol | $C_4H_6O_2$ | 78.4 | .00104139 | 07836000 | 01761800 | 0.80950 | |
| Ether | $C_8H_{10}O_2$ | 34.9 | .00148026 | 35031600 | 02700700 | 0.78660 | |
| Aldehyde | $C_4H_4O_2$ | 20.8 | .00154640 | 69745000 | | 0.80092 | |
| Acetone | $C_3H_3O$ | 56.3 | .00134810 | 26090000 | 01056830 | 0.81440 | |
| Benzol | $C_{12}H_6$ | 80.8 | .00117626 | 12775500 | 00806480 | 0.89911 | |
| Formic Acid | $C_2H_2O_4$ | 105.3 | .00099269 | 06251400 | 00596500 | 1.22270 | |
| Acetic " | $C_4H_4O_4$ | 117.3 | .00105703 | 01832300 | 00964350 | 1.08005 | |
| Butyric " | $C_8H_8O_4$ | 157.0 | .00104610 | 05624400 | 00542010 | 0.98860 | |
| Formate of Methyl | $C_4H_4O_4$ | 33.4 | .00140550 | 17131000 | 04594700 | 0.99840 | |
| " " Ethyl | $C_6H_6O_4$ | 54.9 | .00136446 | 01353800 | 03924800 | 0.94474 | |
| Acetate of Methyl | $C_6H_6O_4$ | 56.3 | .00127790 | 39471000 | 00363900 | 0.95620 | |
| " " Ethyl | $C_8H_8O_4$ | 74.3 | .00127380 | 21914000 | 01179700 | 0.91046 | |
| Butyrate of Methyl | $C_{10}H_{10}O_4$ | 98.6 | .00119565 | 18103000 | 00982920 | 0.92098 | |
| " " Ethyl | $C_{12}H_{12}O_4$ | 114.8 | .00117817 | 13093000 | 00956000 | 0.90412 | |
| Valerate of Methyl | $C_{12}H_{12}O_4$ | 116.2 | +.00112115 | +01704400 | +00586270 | 0.90150 | |

## TABLE

OF THE ELEVATION OF THE BOILING POINT BY DISSOLVING SALTS IN WATER.

LEGRAND. — Annales de Chemie et de Physique.

*The salts are nearly all anhydrous.*

| Name of Salt. | Boiling Point C°. | Proportion of salt to 100 of Water. |
|---|---|---|
| Chloride of Barium | 104.40 | 60.1 |
| Chlorate of Potassium | 104.20 | 61.5 |
| Carbonate of Sodium | 104.63 | 48.5 |
| Phosphate of Sodium | 106.60 | 112.6 |
| Chloride of Potassium | 108.30 | 59.4 |
| Chloride of Sodium | 108.40 | 41.2 |
| Chloride of Ammonium | 114.20 | 88.9 |
| Tartrate of Potassium | 114.67 | 296.2 |
| Nitrate of Potassium | 115.90 | 335.1 |
| Chloride of Strontium | 117.85 | 117.5 |
| Nitrate of Sodium | 121.00 | 224.0 |
| Acetate of Sodium | 124.37 | 209.0 |
| Carbonate of Potassium | 135.00 | 205.0 |
| Nitrate of Calcium | 151.00 | 362.2 |
| Acetate of Potassium | 169.00 | 798.2 |
| Chloride of Lime | 179.50 | 325.0 |
| Nitrate of Ammonia | 180.00 | Any Amount. |

## TABLE

OF THE VOLUME OF WATER AT DIFFERENT TEMPERATURES.

| Temperature. | Kopp. | Calculated by Frankenheim from Pierre's formulas. | Depretz. Water at 4° C = 1. |
|---|---|---|---|
| —15° | | 1.0037584 | |
| 10 | | 1.0016851 | |
| 9 | | 1.0014013 | 1.0016311 |
| 8 | | 1.0011526 | 1.0013734 |
| 7 | | 1.0009355 | 1.0011354 |
| 6 | | 1.0007465 | 1.0009184 |
| 5 | | 1.0005819 | 1.0006987 |
| 4 | | 1.0004382 | 1.0005619 |
| 3 | | 1.0003117 | 1.0004222 |
| 2 | | 1.0001989 | 1.0003077 |
| — 1 | | 1.0000962 | 1.0002138 |

| Temperature. | Kopp. | Calculated by Frankenheim from Pierre's formulas. | Depretz. Water at 4° C = 1. |
|---|---|---|---|
| ° | | | |
| 0 | 1.000000 | 1.0000000 | 1.0001269 |
| + 1 | 0.999947 | 0.9999458 | 1.0000730 |
| 2 | 0.999908 | 0.9999094 | 1.0000331 |
| 3 | 0.999885 | 0.9998878 | 1.0000083 |
| 4 | 0.999877 | 0.9998820 | 1.0000000 |
| 5 | 0.999883 | 0.9998903 | 1.0000082 |
| 6 | 0.999903 | 0.9999148 | 1.0000309 |
| 7 | 0.999938 | 0.9999524 | 1.0000708 |
| 8 | 0.999986 | 1.0000044 | 1.0001216 |
| 9 | 1.000048 | 1.0000694 | 1.0001879 |
| 10 | 1.000124 | 1.0001482 | 1.0002684 |
| 11 | 1.000213 | 1.0002392 | 1.0003598 |
| 12 | 1.000314 | 1.0003420 | 1.0004724 |
| 13 | 1.000429 | 1.0004557 | 1.0005862 |
| 14 | 1.000556 | 1.0005877 | 1.0007146 |
| 15 | 1.000695 | 1.0007275 | 1.0008751 |
| 16 | 1.000846 | 1.0008784 | 1.0010215 |
| 17 | 1.001010 | 1.0010404 | 1.0012067 |
| 18 | 1.001184 | 1.0012132 | 1.0013900 |
| 19 | 1.001370 | 1.0013965 | 1.0015800 |
| 20 | 1.001567 | 1.0015940 | 1.0017900 |
| 21 | 1.001776 | 1.0017997 | 1.0020000 |
| 22 | 1.001995 | 1.0020108 | 1.0022200 |
| 23 | 1.002225 | 1.0022310 | 1.0024400 |
| 24 | 1.002465 | 1.0024648 | 1.0027100 |
| 25 | 1.002715 | 1.0027075 | 1.0029300 |
| 26 | | 1.0029588 | 1.0032100 |
| 27 | | 1.0032211 | 1.0034500 |
| 28 | | 1.0034944 | 1.0037400 |
| 29 | | 1.0037758 | 1.0040300 |
| 30 | 1.004064 | 1.0040710 | 1.0043300 |
| 35 | 1.005697 | 1.0056770 | 1.0059300 |
| 40 | 1.007531 | 1.0075120 | 1.0077300 |
| 45 | 1.009541 | 1.0095625 | 1.0098500 |
| 50 | 1.011766 | 1.0118150 | 1.0120500 |
| 55 | 1.014100 | 1.0143596 | 1.0144500 |
| 60 | 1.016590 | 1.0171180 | 1.0169800 |
| 65 | 1.019302 | 1.0199465 | 1.0196700 |
| 70 | 1.022246 | 1.0229376 | 1.0225500 |
| 75 | 1.025440 | 1.0260782 | 1.0256200 |
| 80 | 1.028581 | 1.0293600 | 1.0288500 |
| 85 | 1.031894 | 1.0327692 | 1.0322500 |
| 90 | 1.035397 | 1.0362943 | 1.0356600 |
| 95 | 1.039094 | 1.0399247 | 1.0392500 |
| +100 | 1.042986 | 1.0436490 | 1.0431500 |

# TABLE

## OF THE TENSION OF THE VAPOR OF ABSOLUTE ALCOHOL.

*Calculated from Regnault's data by Bunsen.*

| Centigrade. | Tenths of Degrees. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| ° | mm. | | | | | | | | | |
| 0 | 12.73 | 12.82 | 12.91 | 13.01 | 13.10 | 13.19 | 13.28 | 13.37 | 13.46 | 13.56 |
| 1 | 13.65 | 13.74 | 13.84 | 13.93 | 14.03 | 14.12 | 14.22 | 14.31 | 14.41 | 14.50 |
| 2 | 14.60 | 14.70 | 14.79 | 14.89 | 14.99 | 15.09 | 15.19 | 15.29 | 15.39 | 15.49 |
| 3 | 15.59 | 15.69 | 15.79 | 15.90 | 16.00 | 16.10 | 16.21 | 16.31 | 16.41 | 16.52 |
| 4 | 16.62 | 16.73 | 16.84 | 16.95 | 17.05 | 17.16 | 17.27 | 17.38 | 17.48 | 17.59 |
| 5 | 17.70 | 17.82 | 17.93 | 18.04 | 18.16 | 18.27 | 18.38 | 18.50 | 18.61 | 18.73 |
| 6 | 18.84 | 18.96 | 19.08 | 19.20 | 19.32 | 19.44 | 19.56 | 19.68 | 19.80 | 19.92 |
| 7 | 20.04 | 20.17 | 20.30 | 20.43 | 20.55 | 20.68 | 20.81 | 20.93 | 21.06 | 21.19 |
| 8 | 21.31 | 21.45 | 21.58 | 21.72 | 21.85 | 21.99 | 22.12 | 22.25 | 22.39 | 22.52 |
| 9 | 22.66 | 22.80 | 22.94 | 23.08 | 23.23 | 23.37 | 23.51 | 23.65 | 23.79 | 23.94 |
| 10 | 24.08 | 24.23 | 24.38 | 24.53 | 24.68 | 24.83 | 24.99 | 25.14 | 25.29 | 25.44 |
| 11 | 25.59 | 25.75 | 25.91 | 26.07 | 26.23 | 26.39 | 26.55 | 26.71 | 26.87 | 27.03 |
| 12 | 27.19 | 27.36 | 27.53 | 27.70 | 27.87 | 28.04 | 28.21 | 28.38 | 28.55 | 28.72 |
| 13 | 28.89 | 29.07 | 29.25 | 29.43 | 29.61 | 29.79 | 29.97 | 30.15 | 30.23 | 30.51 |
| 14 | 30.69 | 30.88 | 31.07 | 31.26 | 31.45 | 31.64 | 31.84 | 32.03 | 32.22 | 32.41 |
| 15 | 32.60 | 32.80 | 33.01 | 33.21 | 33.41 | 33.61 | 33.82 | 34.02 | 34.22 | 34.42 |
| 16 | 34.62 | 34.84 | 35.05 | 35.27 | 35.48 | 35.70 | 35.91 | 36.13 | 36.34 | 36.56 |
| 17 | 36.77 | 37.00 | 37.23 | 37.45 | 37.68 | 37.91 | 38.14 | 38.36 | 38.59 | 38.82 |
| 18 | 39.05 | 39.29 | 39.53 | 39.77 | 40.01 | 40.25 | 40.49 | 40.73 | 40.97 | 41.21 |
| 19 | 41.45 | 41.71 | 41.96 | 42.22 | 42.47 | 42.73 | 42.98 | 43.24 | 43.49 | 43.75 |
| 20 | 44.00 | 44.27 | 44.54 | 44.81 | 45.08 | 45.35 | 45.61 | 45.88 | 46.15 | 46.42 |
| 21 | 46.69 | 46.98 | 47.26 | 47.55 | 47.83 | 48.12 | 48.40 | 48.69 | 48.97 | 49.26 |
| 22 | 49.54 | 49.84 | 50.14 | 50.44 | 50.74 | 51.04 | 51.34 | 51.64 | 51.94 | 52.24 |
| 23 | 52.54 | 52.86 | 53.17 | 53.49 | 53.81 | 54.12 | 54.44 | 54.75 | 55.07 | 55.38 |
| 24 | 55.70 | 56.04 | 56.37 | 56.70 | 57.03 | 57.37 | 57.70 | 58.03 | 58.36 | 58.70 |
| 25 | 59.03 | 59.38 | 59.73 | 60.08 | 60.43 | 60.78 | 61.13 | 61.48 | 61.83 | 62.18 |
| 26 | 62.53 | 62.90 | 63.27 | 63.64 | 64.01 | 64.37 | 64.74 | 65.11 | 65.48 | 65.85 |
| 27 | 66.22 | 66.60 | 66.99 | 67.38 | 67.77 | 68.15 | 68.54 | 68.93 | 69.31 | 69.70 |
| 28 | 70.02 | 70.49 | 70.89 | 71.29 | 71.69 | 72.09 | 72.49 | 72.89 | 73.29 | 73.69 |
| 29 | 74.09 | 74.53 | 74.96 | 75.39 | 75.82 | 76.25 | 76.68 | 77.12 | 77.55 | 77.98 |
| 30 | 78.40 | | | | | | | | | |

## TENSION OF THE VAPOR OF ALCOHOL.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 374.

*In this and the following Tables of Tensions of Vapor the Temperature is in degrees of the Air Thermometer.*

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | | mm. |
| —20 | 3.34 | 20 | 44.46 | 60 | 350.21 | 95 | 1425.13 | 135 | 4964.22 |
| —15 | 5.10 | 25 | 59.37 | 65 | 436.90 | 100 | 1697.55 | 140 | 5674.59 |
| —10 | 6.47 | 30 | 78.52 | 70 | 541.15 | 105 | 2010.38 | 145 | 6458.10 |
| — 5 | 9.09 | 35 | 102.91 | 75 | 665.54 | 110 | 2367.64 | 150 | 7318.40 |
| 0 | 12.70 | 40 | 133.69 | 78.26 | 760.00 | 115 | 2773.40 | 155 | 8259.19 |
| + 5 | 17.62 | 45 | 172.18 | 80 | 812.91 | 120 | 3231.73 | | |
| 10 | 24.23 | 50 | 219.90 | 85 | 986.40 | 125 | 3746.88 | | |
| 15 | 32.98 | 55 | 278.59 | 90 | 1189.30 | 130 | 4323.00 | | |

## TENSION OF THE VAPOR OF ETHER.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 392.

| Temperature | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| —20 | 68.90 | 10 | 286.83 | 35 | 761.20 | 65 | 1998.87 | 95 | 4401.81 |
| —15 | 89.31 | 15 | 353.62 | 40 | 907.04 | 70 | 2304.90 | 100 | 4953.30 |
| —10 | 114.72 | 20 | 432.78 | 45 | 1074.15 | 75 | 2645.41 | 105 | 5556.23 |
| — 5 | 146.06 | 25 | 525.93 | 50 | 1264.83 | 80 | 3022.79 | 110 | 6214.63 |
| 0 | 184.39 | 30 | 634.80 | 55 | 1481.06 | 85 | 3439.53 | 115 | 6933.26 |
| + 5 | 230.89 | 34.97 | 760.00 | 60 | 1725.01 | 90 | 3898.26 | 120 | 7719.20 |

## TENSION OF THE VAPOR OF BISULPHIDE OF CARBON.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 402.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| —20 | 47.30 | 20 | 298.03 | 55 | 1001.57 | 95 | 2966.34 | 135 | 6925.90 |
| —15 | 61.64 | 25 | 361.13 | 60 | 1164.51 | 100 | 3325.15 | 140 | 7603.96 |
| —10 | 79.44 | 30 | 434.62 | 65 | 1347.52 | 105 | 3727.19 | 145 | 8326.92 |
| — 5 | 101.29 | 35 | 519.66 | 70 | 1552.09 | 110 | 4164.06 | 150 | 9095.94 |
| 0 | 127.91 | 40 | 617.53 | 75 | 1779.88 | 115 | 4637.41 | | |
| + 5 | 160.01 | 45 | 729.53 | 80 | 2032.53 | 120 | 5148.79 | | |
| 10 | 198.46 | 46.20 | 760.00 | 85 | 2311.70 | 125 | 5699.69 | | |
| 15 | 244.13 | 50 | 857.07 | 90 | 2619.08 | 130 | 6291.60 | | |

## TENSION OF THE VAPOR OF CHLOROFORM.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 415.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| +20 | 160.47 | 55 | 637.71 | 85 | 1624.10 | 120 | 3925.74 | 155 | 7985.35 |
| 25 | 200.18 | 60 | 755.44 | 90 | 1865.22 | 125 | 4386.60 | 160 | 8734.20 |
| 30 | 247.51 | 60.16 | 760.00 | 95 | 2132.85 | 130 | 4885.10 | 165 | 9527.82 |
| 35 | 303.49 | 65 | 889.72 | 100 | 2428.54 | 135 | 5422.53 | | |
| 40 | 369.26 | 70 | 1042.11 | 105 | 2754.03 | 140 | 6000.16 | | |
| 45 | 446.01 | 75 | 1214.20 | 110 | 3110.99 | 145 | 6619.20 | | |
| 50 | 535.05 | 80 | 1407.64 | 115 | 3501.03 | 150 | 7280.62 | | |

## TENSION OF THE VAPOR OF BENZINE.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 428.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| —20 | 5.79 | 20 | 75.65 | 60 | 390.10 | 95 | 1167.46 | 135 | 3158.51 |
| —15 | 8.82 | 25 | 95.91 | 65 | 463.43 | 100 | 1340.05 | 140 | 3520.73 |
| —10 | 12.92 | 30 | 120.24 | 70 | 547.42 | 105 | 1531.83 | 145 | 3912.11 |
| — 5 | 18.33 | 35 | 149.26 | 75 | 643.18 | 110 | 1744.12 | 150 | 4333.71 |
| 0 | 25.31 | 40 | 183.62 | 80 | 751.86 | 115 | 1978.22 | | |
| + 5 | 34.17 | 45 | 224.06 | 80.36 | 760.00 | 120 | 2235.44 | | |
| 10 | 45.25 | 50 | 271.37 | 85 | 874.63 | 125 | 2517.06 | | |
| 15 | 58.93 | 55 | 326.41 | 90 | 1012.75 | 130 | 2824.35 | | |

## TENSION OF THE VAPOR OF CHLORIDE OF CARBON, ($C_2Cl_3$).

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 439.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| —20 | 9.80 | 25 | 114.30 | 70 | 621.15 | 110 | 1887.44 | 155 | 5010.21 |
| —15 | 13.55 | 30 | 142.27 | 75 | 725.66 | 115 | 2129.15 | 160 | 5513.14 |
| —10 | 18.47 | 35 | 175.55 | 76.5 | 760.00 | 120 | 2393.67 | 165 | 6053.83 |
| — 5 | 24.83 | 40 | 214.81 | 80 | 843.29 | 125 | 2682.41 | 170 | 6634.37 |
| 0 | 32.95 | 45 | 260.82 | 85 | 975.12 | 130 | 2996.88 | 175 | 7256.87 |
| + 5 | 43.19 | 50 | 314.38 | 90 | 1122.26 | 135 | 3338.56 | 180 | 7923.55 |
| 10 | 55.97 | 55 | 376.29 | 95 | 1286.86 | 140 | 3709.04 | 185 | 8636.78 |
| 15 | 71.73 | 60 | 447.43 | 100 | 1467.09 | 145 | 4109.99 | 190 | 9399.02 |
| 20 | 90.99 | 65 | 528.74 | 105 | 1667.19 | 150 | 4543.13 | | |

## TENSION OF THE VAPOR OF CHLORIDE OF ETHYL.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 446.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm | ° | mm. | ° | mm. | ° | mm. |
| —30 | 110.24 | 0 | 465.18 | 25 | 1184.17 | 55 | 2668.43 | 85 | 6301.61 |
| —25 | 145.01 | + 5 | 569.32 | 30 | 1398.99 | 60 | 3400.54 | 90 | 7047.51 |
| —20 | 187.85 | 10 | 691.11 | 35 | 1643.24 | 65 | 3878.52 | 95 | 7853.92 |
| —15 | 239.60 | 12.5 | 760.00 | 40 | 1619.58 | 70 | 4405.03 | 100 | 8722.76 |
| —10 | 302.09 | 15 | 832.56 | 45 | 2230.71 | 75 | 4982.72 | | |
| — 5 | 376.72 | 20 | 996.23 | 50 | 2579.40 | 80 | 5614.11 | | |

## TENSION OF THE VAPOR OF BROMIDE OF ETHYL.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 453.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | c | mm. | ° | mm. | ° | mm. | ° | mm. |
| —30 | 32.18 | 10 | 257.40 | 45 | 947.28 | 85 | 3000.63 | 125 | 7362.25 |
| —25 | 44.06 | 15 | 316.92 | 50 | 1112.79 | 90 | 3398.95 | 130 | 8116.49 |
| —20 | 59.16 | 20 | 387.03 | 55 | 1300.35 | 95 | 3835.53 | 135 | 8921.92 |
| —15 | 78.09 | 25 | 469.07 | 60 | 1511.92 | 100 | 4312.32 | 140 | 9779.56 |
| —10 | 101.54 | 30 | 564.51 | 65 | 1749.47 | 105 | 4831.22 | | |
| — 5 | 130.58 | 35 | 674.92 | 70 | 2015.06 | 110 | 5394.01 | | |
| 0 | 665.57 | 38.37 | 760.00 | 75 | 2310.73 | 115 | 6002.41 | | |
| + 5 | 207.21 | 40 | 801.92 | 80 | 2638.57 | 120 | 6658.00 | | |

## TENSION OF THE VAPOR OF IODIDE OF ETHYL.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 456.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| 0 | 41.95 | 15 | 87.64 | 30 | 169.07 | 45 | 303.77 | 60 | 512.25 |
| 15 | 54.14 | 20 | 110.02 | 35 | 207.09 | 50 | 364.00 | | |
| 10 | 69.20 | 25 | 136.95 | 40 | 251.73 | 55 | 433.21 | | |

## TENSION OF THE VAPOR OF WOOD SPIRIT.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 460.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| —30 | 2.67 | 10 | 50.13 | 50 | 381.68 | 85 | 1470.92 | 125 | 4980.55 |
| —25 | 4.14 | 15 | 67.11 | 55 | 472.20 | 90 | 1741.67 | 130 | 5691.30 |
| —20 | 6.27 | 20 | 88.67 | 60 | 579.93 | 95 | 2051.71 | 135 | 6479.32 |
| —15 | 9.29 | 25 | 115.99 | 65 | 707.33 | 100 | 2405.15 | 140 | 7337.10 |
| —10 | 13.47 | 30 | 149.99 | 66.78 | 760.00 | 105 | 2806.27 | 145 | 8308.87 |
| — 5 | 19.17 | 35 | 192.01 | 70 | 857.10 | 110 | 3259.60 | 150 | 9361.35 |
| 0 | 26.82 | 40 | 243.51 | 75 | 1032.14 | 115 | 3769.80 | | |
| + 5 | 36.89 | 45 | 306.13 | 80 | 1238.47 | 120 | 4341.77 | | |

## TENSION OF THE VAPOR OF ACETONE.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 472.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| +20 | 179.63 | 50 | 602.86 | 70 | 1189.38 | 95 | 2452.81 | 120 | 4546.86 |
| 25 | 226.27 | 55 | 725.95 | 75 | 1387.62 | 100 | 2797.27 | 125 | 5086.25 |
| 30 | 281.00 | 56.3 | 760.00 | 80 | 1611.05 | 105 | 3177.00 | 130 | 5669.72 |
| 35 | 345.15 | 60 | 860.48 | 85 | 1861.81 | 110 | 3593.96 | 135 | 6298.68 |
| 40 | 420.15 | 65 | 1014.32 | 90 | 2141.66 | 115 | 4050.02 | 140 | 6974.43 |
| 45 | 507.52 | | | | | | | | |

## TENSION OF THE VAPOR OF BROMIDE OF ETHYLENE.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 468.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| —25 | 1.55 | 30 | 17.20 | 85 | 172.92 | 135 | 833.26 | 190 | 3020.83 |
| —20 | 1.73 | 35 | 21.80 | 90 | 206.58 | 140 | 953.00 | 195 | 3833.45 |
| —15 | 2.03 | 40 | 27.49 | 95 | 245.51 | 145 | 1085.89 | 200 | 3668.36 |
| —10 | 2.48 | 45 | 34.47 | 100 | 290.43 | 150 | 1232.83 | 205 | 4026.25 |
| — 5 | 3.09 | 50 | 42.99 | 105 | 342.11 | 155 | 1394.73 | 210 | 4407.52 |
| 0 | 3.92 | 55 | 53.31 | 110 | 401.08 | 160 | 1572.49 | 215 | 4812.84 |
| + 5 | 5.01 | 60 | 65.75 | 115 | 468.13 | 165 | 1766.99 | 220 | 5242.61 |
| 10 | 6.42 | 65 | 80.64 | 120 | 544.06 | 170 | 1979.14 | 225 | 5597.17 |
| 15 | 8.25 | 70 | 98.36 | 125 | 629.66 | 175 | 2209.77 | 230 | 6176.87 |
| 20 | 10.57 | 75 | 119.34 | 130 | 725.77 | 180 | 2459.73 | 235 | 6681.92 |
| 25 | 13.51 | 80 | 144.02 | 131.6 | 760.00 | 185 | 2729.84 | 240 | 7212.51 |

## TENSION OF THE VAPOR OF CHLORIDE OF SILICON ($SiCl_4$).

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 476.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| —25 | 19.66 | — 5 | 60.52 | 15 | 157.74 | 35 | 356.83 | 55 | 715.44 |
| —20 | 26.49 | 0 | 78.62 | 20 | 195.86 | 40 | 429.08 | 56.81 | 760.00 |
| —15 | 35.28 | + 5 | 99.59 | 25 | 241.15 | 45 | 512.32 | 60 | 837.23 |
| —10 | 46.46 | 10 | 125.90 | 30 | 294.49 | 50 | 607.46 | 65 | 973.74 |

## TENSION OF THE VAPOR OF TERCHLORIDE OF PHOSPHORUS.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 478.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| 0 | 37.98 | 20 | 100.55 | 40 | 233.78 | 55 | 408.46 | 70 | 674.23 |
| + 5 | 49.09 | 25 | 125.59 | 45 | 283.46 | 60 | 485.63 | 73.80 | 760.00 |
| 10 | 62.88 | 30 | 155.65 | 50 | 341.39 | 65 | 573.86 | 75 | 787.61 |
| 15 | 79.85 | 35 | 191.45 | | | | | | |

## TENSION OF THE VAPOR OF TERCHLORIDE OF BORON.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 480.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| —30 | 98.25 | — 5 | 310.30 | 18.23 | 760.00 | 40 | 1535.25 | 65 | 3010.24 |
| —25 | 125.68 | 0 | 381.32 | 20 | 807.50 | 45 | 1775.69 | 70 | 3392.12 |
| —20 | 159.46 | + 5 | 465.03 | 25 | 957.29 | 50 | 2042.25 | 75 | 3804.79 |
| —15 | 200.69 | 10 | 562.94 | 30 | 1127.50 | 55 | 2336.17 | 80 | 4248.28 |
| —10 | 250.54 | 15 | 676.57 | 35 | 1319.66 | 60 | 2658.52 | 85 | 4720.11 |

## TENSION OF THE VAPOR OF CHLORIDE OF CYANOGEN.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 484.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| —30 | 68.30 | — 5 | 350.20 | 15 | 830.30 | 40 | 1987.96 | 65 | 4232.24 |
| —25 | 103.38 | 0 | 444.11 | 20 | 1001.87 | 45 | 2329.77 | 70 | 4873.19 |
| —20 | 148.21 | + 5 | 553.99 | 25 | 1199.76 | 50 | 2719.29 | 75 | 5594.58 |
| —15 | 203.58 | 10 | 681.92 | 30 | 1427.43 | 55 | 3162.11 | | |
| —10 | 270.51 | 12.66 | 760.00 | 35 | 1688.74 | 60 | 3664.24 | | |

## TENSION OF THE VAPOR OF OIL OF TURPENTINE.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 501.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| 0 | 2.07 | 60 | 26.46 | 120 | 257.21 | 160 | 775.09 | 190 | 1473.24 |
| 10 | 2.94 | 70 | 40.64 | 130 | 348.98 | 165 | 871.27 | 195 | 1618.26 |
| 20 | 4.45 | 80 | 61.30 | 140 | 464.02 | 170 | 975.42 | 200 | 1771.47 |
| 30 | 6.87 | 90 | 90.61 | 150 | 605.20 | 175 | 1090.11 | | |
| 40 | 10.80 | 100 | 131.11 | 155 | 686.37 | 180 | 1207.92 | | |
| 50 | 16.98 | 110 | 185.62 | 159.2 | 760.00 | 185 | 1336.45 | | |

## TENSION OF THE VAPOR OF SULPHUR.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 530.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| 390 | 272.31 | 430 | 560.98 | 470 | 1063.17 | 510 | 1871.57 | 550 | 3086.51 |
| 400 | 328.98 | 440 | 663.11 | 480 | 1232.70 | 520 | 2133.30 | 560 | 3465.33 |
| 410 | 395.20 | 450 | 779.89 | 490 | 1422.88 | 530 | 2421.97 | 570 | 3877.08 |
| 420 | 472.11 | 460 | 912.74 | 500 | 1635.32 | 540 | 2739.21 | | |

## TENSION OF THE VAPOR OF SULPHUROUS ACID.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 590.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| —30 | 287.47 | —10 | 762.49 | 10 | 1799.55 | 30 | 3431.80 | 50 | 6220.01 |
| —25 | 373.79 | — 5 | 946.90 | 15 | 2064.90 | 35 | 4014.78 | 55 | 7125.02 |
| —20 | 479.46 | 0 | 1165.06 | 20 | 2462.05 | 40 | 4670.23 | 60 | 8123.80 |
| —15 | 607.90 | + 5 | 1421.14 | 25 | 2915.97 | 45 | 5403.52 | 65 | 9221.40 |
| 10.08 | 760.00 | | | | | | | | |

## TENSION OF THE VAPOR OF OXIDE OF METHYL.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 593.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| —30 | 576.54 | —20 | 882.00 | —5 | 1572.51 | 10 | 2628.97 | 25 | 4151.00 |
| —25 | 716.08 | —15 | 1077.67 | 0 | 1879.02 | 15 | 3079.80 | 30 | 4777.99 |
| 23.65 | 760.00 | —10 | 1306.68 | +5 | 2229.93 | 20 | 3586.01 | | |

## TENSION OF THE VAPOR OF CHLORIDE OF METHYL.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 595.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| —30 | 578.99 | —20 | 883.25 | — 5 | 1578.70 | 10 | 2663.81 | 25 | 4267.40 |
| —25 | 717.76 | —15 | 1079.20 | 0 | 1891.00 | 15 | 3134.10 | 30 | 4940.46 |
| 23.73 | 760.00 | —10 | 1309.61 | + 5 | 2251.08 | 20 | 3666.95 | 35 | 5691.08 |

## TENSION OF THE VAPOR OF AMMONIA.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 607.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm | ° | mm. | ° | mm. | ° | mm. |
| —38.5 | 760.00 | — 5 | 2624.22 | 25 | 7477.00 | 55 | 17219.78 | 85 | 34330.87 |
| —30 | 866.09 | 0 | 3183.34 | 30 | 8700.97 | 60 | 19482.10 | 90 | 38109.22 |
| —25 | 1104.28 | + 5 | 3830.34 | 35 | 10070.18 | 65 | 21965.13 | 95 | 42195.71 |
| —20 | 1392.13 | 10 | 4574.03 | 40 | 11595.30 | 70 | 24675.55 | 100 | 46608.24 |
| —15 | 1736.48 | 15 | 5423.40 | 45 | 13287.31 | 75 | 27629.98 | | |
| —10 | 2144.62 | 20 | 6387.78 | 50 | 15158.33 | 80 | 30843.09 | | |

### TENSION OF THE VAPOR OF SULPHURETTED HYDROGEN.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 616.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| −61.8 | 760.00 | − 5 | 7066.03 | 15 | 12447.94 | 35 | 20224.31 | 55 | 30690.69 |
| −25 | 3749.33 | 0 | 8206.29 | 20 | 14151.51 | 40 | 22582.46 | 60 | 33740.16 |
| −20 | 4438.45 | + 5 | 9490.80 | 25 | 16012.39 | 45 | 24954.26 | 65 | 36961.55 |
| −15 | 5196.52 | 10 | 10896.32 | 30 | 18035.35 | 50 | 27814.77 | 70 | 40353.25 |
| −10 | 6084.57 | | | | | | | | |

### TENSION OF THE VAPOR OF CARBONIC ACID.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 625.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| 78.2 | 760.00 | −10 | 20340.20 | + 5 | 30753.80 | 20 | 44716.58 | 35 | 62447.30 |
| −25 | 13007.02 | − 5 | 23441.34 | 10 | 34998.65 | 25 | 50207.32 | 40 | 69184.45 |
| −20 | 15142.44 | 0 | 26906.60 | 15 | 39646.86 | 30 | 56119.05 | 45 | 73314.60 |
| −15 | 17582.48 | | | | | | | | |

### TENSION OF THE VAPOR OF PROTOXIDE OF NITROGEN.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 631.

| Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. | Temperature. | Tension. |
|---|---|---|---|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. | ° | mm. | ° | mm. |
| 87.9 | 760.00 | −15 | 19684.33 | 0 | 27420.97 | 15 | 37831.66 | 30 | 51708.55 |
| −25 | 15694.88 | −10 | 22008.05 | + 5 | 30558.64 | 20 | 42027.88 | 35 | 57268.08 |
| −20 | 17586.58 | − 5 | 24579.20 | 10 | 34019.09 | 25 | 46641.40 | 40 | 63359.78 |

NOTE. — Tables for tension of vapor of Water and Mercury will be found in the next section.

# TABLE

## OF UNITS OF HEAT EVOLVED BY THE COMBINATION OF EQUIVALENTS, IN GRAMMES, OF SOME OF THE ELEMENTS.

*The quantity of Heat necessary to raise* 1 *gramme of Water at* 0° *C. one degree, being unity. Hydrogen* = 1. *Those marked F. S. are by Favre and Silbermann, A. by Andrews. Those marked* * *were calculated, the others observed.*

MILLER. — Chem. Physics, p. 309.

| Elements. | Observers. | Oxygen. | Chlorine. | Bromine. | Iodine. | Sulphur. |
|---|---|---|---|---|---|---|
| Hydrogen | F. S. | 34462 | 23783 | *9322 | *3606 | *2741 |
| Carbon | F. S. | 24240 | | | | |
| Sulphur | F. S. | 17760 | | | | |
| Phosphorus | A. | 36072 | | | | |
| Potassium | A. | | 104476 | | | |
| " | F. S. | | *100960 | *90188 | *77268 | *45638 |
| Sodium | F. S. | | 94847 | | | |
| Zinc | A. | 42282 | 50658 | 40640 | 26617 | |
| " | F. S. | *42451 | *50296 | | | *20940 |
| Iron | A. | 33072 | 32695 | 23833 | 8046 | |
| " | F. S. | *37828 | *49651 | | | *17753 |
| Tin | A. | 33519 | *31722 | | | |
| Arsenic | A. | | 24992 | | | |
| Antimony | Dulong | 47000 | A. 30401 | | | |
| Copper | Dulong | 19152 | 30404 | | | |
| " | F. S. | *21885 | *29524 | | | *9133 |
| Lead | F. S. | *27675 | *44730 | *32802 | *23208 | *9556 |
| Silver | F. S. | *6113 | *34800 | *25618 | *18651 | *5524 |

## HEAT EVOLVED DURING COMBUSTION IN OXYGEN.

*Heat unit* = 1 *gramme of water at* 0° *C. raised* 1°.

MILLER. Chem. Physics, p. 299.

| Substance burned. | Heat units evolved by combustion of 1 gramme of substance. | Heat units evolved by combination of 1 gramme of Oxygen. | Heat units evolved by 8 grammes (1 eqt.) of Oxygen. | Compound formed. | Observers. |
|---|---|---|---|---|---|
| Hydrogen | 34462 | 4307 | 34462 | HO | F. & S.* |
| " | 34743 | 4343 | 34743 | " | Dulong |
| Carbon | 8080 | 3030 | 24240 | $CO_2$ | F. & S. |
| " | 7912 | 6967 | 23736 | " | Despretz |
| Sulphur | 2220 | 2220 | 17760 | $SO_2$ | F. & S. |
| " | 2307 | 2307 | 18456 | " | Andrews |
| " | 2601 | 2601 | 20808 | " | Dulong |
| Phosphorus | 5747 | 4509 | 36072 | $PO_5$ | Andrews |
| " | 5669 | 4394 | 35148 | " | Abria |
| Zinc | 1301 | 5285 | 42282 | ZnO | Andrews |
| " | 1298 | 5273 | 42185 | " | Dulong |
| Iron | 1576 | 4134 | 33072 | $Fe_3O_4$ | Andrews |
| " | 1702 | 4340 | 34720 | " | Dulong |
| Cobalt | 1080 | 3995 | 31960 | ? | " |
| Nickel | 1006 | 3723 | 29784 | NiO | " |
| Tin | 1233 | 4545 | 36360 | $SnO_2$ | " |
| " | 1144 | 4230 | 33519 | " | Andrews |
| Antimony | 961 | 5875 | 47000 | $SbO_4$ | Dulong |
| Copper | 602 | 2394 | 19152 | CuO | Andrews |
| " | 632 | 2512 | 20096 | " | Dulong |
| Carbonic Oxide | 2634 | 4609 | 36876 | $CO_2$ | " |
| " " | 2431 | 4258 | 34034 | " | Andrews |
| " " | 2403 | 4205 | 33642 | " | F. & S. |
| Protoxide of Tin | 534 | 4473 | 35784 | $SnO_2$ | Dulong |
| " " | 521 | 4349 | 34792 | " | Andrews |
| Suboxide of Copper | 256 | 2288 | 18304 | CuO | " |
| " " | 244 | 2185 | 17480 | " | Dulong |
| Cyanogen | 5195 | 4221 | 33768 | " | " |
| Marsh Gas | 13063 | 3266 | 26128 | | F. & S. |
| " " | 13185 | 3296 | 26368 | | Dulong |
| Olefiant Gas | 11942 | 3483 | 27864 | | Andrews |
| " " | 11858 | 3458 | 27664 | | F. & S. |
| " " | 12030 | 3514 | 28112 | | Dulong |
| Alcohol | 6909 | 3311 | 26488 | | " |
| " | 6850 | 3282 | 26256 | | Andrews |
| " | 7183 | 3442 | 27536 | | F. & S. |
| Ether | 9027 | 3480 | 27840 | | " |
| Olive Oil | 9862 | | | | Dulong |
| Oil of Turpentine | 10852 | 3294 | 26352 | | F. & S. |
| Bisulphide of Carbon | 3401 | 2692 | 21536 | | " |

* F. & S., Favre and Silbermann.

## QUANTITIES OF HEAT DISENGAGED BY THE ACTION OF BROMINE AND IODINE.

MILLER. — Chem. Physics, p. 300.

| Elements. | Heat units evolved by combination of 1 gramme of the substance. | Heat units evolved by combination of 1 gramme of Iodine or Bromine. | Heat units evolved by combination of 1 eqt. of Bromine or Iodine. | Compound produced. | Observer. |
|---|---|---|---|---|---|
| **Bromine.** | | | | | |
| Zinc | 1269 | 508 | 40610 | $ZnBr$ | Andrews |
| Iron | 1277 | 298 | 23833 | $Fe_2Br_3$ | " |
| **Iodine.** | | | | | |
| Zinc | 819 | 209 | 26617 | $ZnI$ | Andrews |
| Iron | 463 | 63 | 8046 | $Fe_2I_3$ | " |

## QUANTITIES OF HEAT DISENGAGED BY THE ACTION OF CHLORINE.

MILLER. — Chem. Physics, p. 300.

| Elements. | Heat units evolved by combination of 1 gramme of the Element. | Heat units evolved by combination of 1 gramme of Chlorine. | Heat units evolved by combination of 1 eqt. of Chlorine. | Compound produced. | Observer. |
|---|---|---|---|---|---|
| Hydrogen | 24087 | 678 | 24087 | $HCl$ | Abria |
| " | 23783 | 670 | 23783 | " | F. & S. |
| Phosphorus | 3422? | 607 | 21548 | $PCl_5$? | Andrews |
| Potassium | 2655 | 2943 | 104476 | $KCl$ | " |
| Zinc | 1529 | 1427 | 50658 | $ZnCl$ | " |
| Iron | 1745 | 921 | 32695 | $Fe_2Cl_3$ | " |
| Tin | 1079 | 897 | 31722 | $SnCl_2$ | " |
| Antimony | 707 | 860 | 30401 | $SbCl_3$ | " |
| Arsenic | 994 | 704 | 24992 | $AsCl_3$ | " |
| Copper | 961 | 859 | 30494 | $CuCl$ | " |
| Mercury | ? | 822 | 29181 | ? | " |

## HEAT UNITS EVOLVED BY COMBINATION OF ONE EQUIVALENT OF THE UNDERMENTIONED BASES WITH ONE EQUIVALENT OF CERTAIN ACIDS.

MILLER. — Chem. Physics, pp. 310, 311.

| Acl | Observers. | Potassium. | Sodium. | Ammonium. | Magnesium. | Zinc. | Manganese. | Nickel. | Cobalt. | Iron (ferrous). | Copper. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulphuric | F. & S. | 16083 | 15810 | 14690 | 14440 | 10455 | 12075 | 11932 | 11780 | 10872 | 7720 |
| " | A. | 15900 | 16200 | 13900 | 18500 | 11800 | | | | | |
| Nitric | F. & S. | 15510 | 15283 | 13676 | 12840 | 8323 | 10850 | 10450 | 9956 | 9648 | 6400 |
| " | A. | 14600 | 14000 | 12200 | 17700 | 10300 | | | | | |
| Phosphoric | F. & S. | 17766 | | | | | | | | | |
| " | A. | 14200 | 14000 | | | | | | | | |
| Arsenic | A. | 14100 | 13900 | 12200 | | | | | | | |
| Hydrochloric | A. | 14300 | 14700 | 12200 | 17700 | 10600 | | | | | |
| " | F. & S. | 15656 | 15128 | 13536 | 13220 | 8307 | 11235 | 10412 | 10374 | 9828 | 6416 |
| Hydrobromic | F. & S. | 15510 | 15159 | | | | | | | | |
| Hydriodic | F. & S. | 15698 | 15097 | | | | | | | | |
| " | A. | 14200 | 14100 | 14700 | 11900 | 9800 | | | | | |
| Oxalic | A. | 14400 | 14600 | 12400 | | | | | | | |
| " | F. & S. | 14156 | 13752 | | | | | | | | |
| Acetic | F. & S. | 13973 | 13600 | 12649 | 12270 | 7720 | 9982 | 9245 | 9272 | 8590 | 5264 |
| Formic | F. & S. | | 13308 | | | | | | | | |
| " | A. | 13900 | | | | | | | | | |
| Tartaric | A. | 13200 | 12900 | 11200 | | | | | | | |
| " | F. & S. | 13425 | 12651 | | | | | | | | |
| Citric | A. | 13200 | 12900 | 11000 | | | | | | | |
| " | F. & S. | 13658 | 13178 | | | | | | | | |
| Succinic | A. | 13400 | 12900 | 11200 | | | | | | | |

F. & S., Favre and Silbermann; A., Andrews.

# TABLES

# FOR GAS ANALYSIS.

# FORMULAS

## FOR THE WEIGHTS, VOLUMES, AND DENSITIES OF GASES.

Volume of a gas at 0° C. and 760 mm. when its volume at a given temperature and pressure is known.

$$V^0 = V' \frac{1}{1 + 0.00367\,t} \times \frac{h}{760}.$$

$V^0$ = volume at 0° C. 760 mm.,
$V'$ = the observed volume,
$h$ = " " pressure in mm. of mercury reduced to 0° C.

Density at 0° C. and 760 mm. when the density at a given temperature and pressure is known.

$$D^0 = D' (1 + 0.00367\,t) \frac{760}{h}.$$

$D^0$ = density at 0° C. and 760 mm.,
$D'$ = observed density.

To determine the density of a gas or vapor by Gay-Lussac's method.

$$D = \frac{w}{0.001293\,V \frac{1}{1 + 0.00367\,t} \times \frac{h}{760}}.$$

$w$ = the weight of the vapor,
$V$ = the observed volume,
$h$ = " " pressure in mm. of mercury at 0° C.,
$t$ = temperature of the vapor,
0.001293 = weight of 1 cubic centimetre of air at 0° C. and 760 mm.

To determine the density of a vapor by Dumas's method.

$$D = \frac{W' - (W - w)}{0.001293\,V \frac{1}{1 + 0.00367\,t} \times \frac{h}{760}}.$$

When there is an air bubble

$$D = \frac{W' - (W - w) - w'}{0.001293\,(V - v') \frac{1}{1 + 0.00367\,t} \times \frac{h}{760}}.$$

In which formulas

$$w = 0.001293\ V \frac{1}{1 + 0.00367\,t} \times \frac{h'}{760}.$$

$$w' = 0.001293\ (V - V') \frac{1}{1 + 0.00367\,t''} \times \frac{h''}{760}.$$

$$v' = (V - V') \frac{1 + 0.00367\,t'}{1 + 0.00367\,t''} \times \frac{h''}{h}.$$

$w$ = weight of air in balloon when first weighed,
$w'$ = weight of air bubble,
$v'$ = volume of air bubble.
$W$ = weight of balloon filled with air,
$t$ = temperature at moment of weighing,
$h'$ = the height of the barometer,
$t'$ = temperature at moment of sealing,
$h$ = height of barometer at moment of sealing,
$W'$ = weight of balloon filled with vapor,
$V$ = capacity of balloon in cubic centimetres,
$V'$ = the volume of water or mercury which enters the balloon.
$(V - V')$ = volume of air bubble,
$t''$ = the temperature during this determination,
$h''$ = pressure on enclosed bubble of air.

In almost all cases the factors into which the pressures enter may be neglected, since they may be regarded as constant during the experiment.

If the expansion of the glass is allowed for, the formula becomes

$$D = \frac{W' - (W - w) - w'}{0.0012932\ (Va - v) \frac{1}{1 + 0.00367\,t} \times \frac{h}{760}}.$$

In which, $a = 1 + k\ (t' - t')$, $k$ being the coefficient of expansion of the glass.

The above formula may be written

$$D = \frac{W' - W + (A \times V \times h') - (A \times (V - V') \times h'')}{\left[Va - (V - V')\ B\ (t' - t') \frac{h''}{h}\right] A' \times h}$$

$$A = \frac{0.0012932}{760\ (1 + 0.00367\,t)}. \qquad B = 1 + \frac{0.00367}{1 + 0.00367\,t''}.$$

$$A' = \frac{0.0012932}{760\,(1 + 0.00367\,t')}. \qquad a = 1 + k\,(t' - t').$$

Which values will be found in the tables. Generally $\frac{h''}{h'}$ and $a$ may be neglected, as they are very small.

Deville and Troost use the following constants in determining vapor densities.

| | | | | °C. |
|---|---|---|---|---|
| Vapor of | Boiling | | Mercury | 350 |
| " | " | " | Sulphur | 440 |
| " | " | " | Cadmium | 860 |
| " | " | " | Zinc | 1040 |

The foregoing formulas by the use of logarithms become

For volume of a gas

$$\text{Log } V^0 = \text{Log } V' + \text{Log } \frac{1}{1 + 0.00367\,t} + \text{Log } \frac{h}{760}.$$

For Logs of $\frac{1}{1 + 0.00367\,t}$ and Log $\frac{h}{760}$ see Tables.

For weight

$$\text{Log weight} = \text{Log } w + \text{Log } V' + \text{Log } \frac{1}{1 + 0.00367\,t} + \text{Log } \frac{h}{760}.$$

$w$ = weight of one cubic centimetre of the gas. (Page 93.)

For the density of a gas at 0° C. and 760 mm.

$$\text{Log } D^0 = \text{Log } D' + \text{Log } (1 + 0.00367\,t) + \text{Log } 760 - \text{Log } h,$$

$$\text{Log } 760 = 2.88081.$$

For the density of a vapor by Gay-Lussac's method

$$\text{Log } D = \text{Log } w - \left[\text{Log } 0.001293 + \text{Log } V + \text{Log } \left(\frac{1}{1 + 0.00367\,t}\right) + \text{Log } \left(\frac{h}{760}\right)\right].$$

**Log .001293 = 7.11166.**

For the density of a vapor by Dumas's method

$$\text{Log } D = \text{Log } [W' - (W - w)] - \left[\text{Log } 0.001293 + \text{Log } V + \text{Log}\left(\frac{1}{1 + 0.00367\,t'}\right) + \text{Log}\left(\frac{h}{760}\right)\right].$$

When there is an air bubble

$$\text{Log } D = \text{Log}[W' - (W - w) - w'] - \left[\text{Log } 0.001293 + \text{Log } (V - v') + \text{Log}\left(\frac{1}{1 + 0.00367\,t'}\right) + \text{Log}\left(\frac{h}{760}\right)\right].$$

$$\text{Log } w = \text{Log } 0.001293 + \text{Log } V + \text{Log}\left(\frac{1}{1 + 0.00367\,t}\right) + \text{Log}\left(\frac{h'}{760}\right).$$

$$\text{Log } w' = \text{Log } 0.001293 + \text{Log } (V - V') + \text{Log}\left(\frac{1}{1 + 0.00367\,t''}\right) + \text{Log}\left(\frac{h''}{760}\right).$$

$$\text{Log } v' = \text{Log } (V - V') + \text{Log } (1 + 0.00367\,t') + \text{Log } h'' + \text{Log}\left(\frac{1}{1 + 0.00367\,t''}\right) + \text{Log}\left(\frac{1}{h}\right).$$

In most cases it will be sufficient to take the value of $h$ to the nearest millimetre.

# TABLE

## OF PHYSICAL PROPERTIES OF SOME OF THE MOST COMMON GASES.

REGNAULT. — Mémoires de l'Académie Royale de France, Tome XXI.

| Name. | Density. | | Coefficients of Expansion for 100° C. | | Weight of 1 cc. 0° C. 760 m. | Log. of the weight of 1 cc. of the gas. |
|---|---|---|---|---|---|---|
| | Air = 1 at 0° C. 760 m. | Water = 1 at 4° C. 760 m. | Constant Volume. | Constant Pressure. | | |
| Air | 1.00000 | 0.001293187 | 0.3665 | 0.3670 | 0.001293187 | 7.11166 |
| Hydrogen | 0.06926 | 0.000089578 | 0.3667 | 0.3661 | 0.000089578 | 5.95220 |
| Nitrogen | 0.97200 | 0.001256167 | 0.3668 | 0.3670 | 0.001256167 | 7.09905 |
| Oxygen | 1.10570 | 0.001429802 | | | 0.001529802 | 7.18464 |
| Carbonic oxide | | | 0.3667 | 0.3669 | | |
| " acid | 1.52901 | 0.001977414 | 0.3688 | 0.3710 | 0.001977414 | 7.29611 |
| Protoxide of Nitrogen | | | 0.3676 | 0.3719 | | |
| Sulphurous acid | | | 0.3845 | 0.3903 | | |
| Cyanogen | | | 0.3829 | 0.3877 | | |

LOGARITHMS OF $\frac{h}{760}$

| Centimetres. | Millimetres. | | | | |
|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 |
| 0 | | 7.11919 | 7.42022 | 7.59631 | 7.72125 |
| 1 | 8.11919 | 8.16058 | 8.19837 | 8.23313 | 8.26531 |
| 2 | .42022 | .44141 | .46161 | .48091 | .49940 |
| 3 | .59631 | .61055 | .62434 | .63770 | .65067 |
| 4 | .72125 | .73197 | .74244 | .75265 | .76264 |
| 5 | .81816 | .82676 | .83519 | .84346 | .85158 |
| 6 | .89734 | .90452 | .91158 | .91853 | .92537 |
| 7 | .96428 | .97043 | .97652 | .98251 | .98841 |
| 8 | 9.02228 | 9.02767 | 9.03300 | 9.03826 | 9.04346 |
| 9 | .07343 | .07823 | .08297 | .08769 | .09231 |
| 10 | .11919 | .12351 | .12779 | .13202 | .13622 |
| 11 | .16058 | .16451 | .16840 | .17226 | .17609 |
| 12 | .19837 | .20197 | .20555 | .20909 | .21261 |
| 13 | .23313 | .23646 | .23976 | .24304 | .24629 |
| 14 | .26531 | .26841 | .27147 | .27452 | .27755 |
| 15 | .29528 | .29816 | .30103 | .30388 | .30671 |
| 16 | .32331 | .32601 | .32870 | .33137 | .33403 |
| 17 | .34964 | .35218 | .35471 | .35723 | .35974 |
| 18 | .37446 | .37687 | .37926 | .38164 | .38400 |
| 19 | .39794 | .40022 | .40249 | .40474 | .40699 |
| 20 | .42022 | .42238 | .42454 | .42668 | .42882 |
| 21 | .44141 | .44347 | .44552 | .44757 | .44960 |
| 22 | .46161 | .46358 | .46554 | .46749 | .46943 |
| 23 | .48091 | .48280 | .48467 | .48654 | .48840 |
| 24 | .49940 | .50120 | .50300 | .50479 | .50658 |
| 25 | .51713 | .51886 | .52059 | .52231 | .52402 |
| 26 | .53416 | .53583 | .53749 | .53914 | .54079 |
| 27 | .55055 | .55216 | .55376 | .55535 | .55694 |
| 28 | .56634 | .56789 | .56944 | .57097 | .57250 |
| 29 | .58158 | .58308 | .58457 | .58605 | .58753 |
| 30 | .59631 | .59775 | .59919 | .60063 | .60206 |
| 31 | .61055 | .61195 | .61334 | .61473 | .61612 |
| 32 | .62434 | .62569 | .62704 | .62839 | .62973 |
| 33 | .63770 | .63901 | .64032 | .64163 | .64293 |
| 34 | .65067 | .65194 | .65321 | .65448 | .65574 |

FROM $\lambda = 1$ TO $\lambda = 699$.

| Centimetres. | Millimetres. | | | | |
|---|---|---|---|---|---|
| | 5 | 6 | 7 | 8 | 9 |
| 0 | 7.81816 | 7.89734 | 7.96428 | 8.02228 | 8.07343 |
| 1 | 8.29538 | 8.32331 | 8.34964 | .37446 | .39794 |
| 2 | .51713 | .53416 | .55055 | .56634 | .58158 |
| 3 | .66325 | .67549 | .68739 | .69897 | .71025 |
| 4 | .77240 | .78194 | .79128 | .80043 | .80938 |
| 5 | .85956 | .86737 | .87506 | .88261 | .89004 |
| 6 | .93210 | .93873 | .94526 | .95169 | .95804 |
| 7 | .99425 | 9.00000 | 9.00568 | 9.01128 | 9.01681 |
| 8 | 9.04860 | .05368 | .05871 | .06367 | .06858 |
| 9 | .09691 | .10145 | .10596 | .11041 | .11482 |
| 10 | .14038 | .14449 | .14857 | .15261 | .15661 |
| 11 | .17988 | .18364 | .18737 | .19107 | .19473 |
| 12 | .21610 | .21956 | .22299 | .22640 | .22978 |
| 13 | .24952 | .25273 | .25591 | .25907 | .26220 |
| 14 | .28055 | .28354 | .28650 | .28945 | .29237 |
| 15 | .30952 | .31231 | .31509 | .31784 | .32058 |
| 16 | .33667 | .33929 | .34190 | .34450 | .34707 |
| 17 | .36222 | .36470 | .36716 | .36961 | .37204 |
| 18 | .38636 | .38870 | .39103 | .39334 | .39565 |
| 19 | .40922 | .41144 | .41365 | .41585 | .41804 |
| 20 | .43094 | .43305 | .43516 | .43725 | .43933 |
| 21 | .45162 | .45364 | .45565 | .45764 | .45963 |
| 22 | .47137 | .47329 | .47521 | .47712 | .47902 |
| 23 | .49025 | .49210 | .49393 | .49576 | .49758 |
| 24 | .50835 | .51012 | .51188 | .51364 | .51539 |
| 25 | .52573 | .52743 | .52912 | .53081 | .53249 |
| 26 | .54243 | .54407 | .54570 | .54732 | .54894 |
| 27 | .55852 | .56010 | .56167 | .56323 | .56479 |
| 28 | .57403 | .57555 | .57707 | .57858 | .58008 |
| 29 | .58901 | .59048 | .59194 | .59340 | .59486 |
| 30 | .60349 | .60491 | .60632 | .60774 | .60914 |
| 31 | .61750 | .61887 | .62025 | .62161 | .62298 |
| 32 | .63107 | .63240 | .63373 | .63506 | .63638 |
| 33 | .64423 | .64553 | .64682 | .64810 | .64939 |
| 34 | .65701 | .65826 | .65952 | .66077 | .66201 |

| Centimetres. | Millimetres. | | | | |
|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 |
| 35 | 9.66325 | 9.66449 | 9.66573 | 9.66696 | 9.66819 |
| 36 | .67549 | .67669 | .67790 | .67909 | .68029 |
| 37 | .68739 | .68856 | .68973 | .69090 | .69206 |
| 38 | .69897 | .70011 | .70125 | .70239 | .70352 |
| 39 | .71025 | .71136 | .71247 | .71358 | .71468 |
| 40 | .72125 | .72233 | .72341 | .72449 | .72556 |
| 41 | .73197 | .73303 | .73408 | .73514 | .73619 |
| 42 | .74244 | .74347 | .74450 | .74553 | .74655 |
| 43 | .75265 | .75366 | .75467 | .75567 | .75668 |
| 44 | .76264 | .76363 | .76461 | .76559 | .76657 |
| 45 | .77240 | .77336 | .77432 | .77528 | .77624 |
| 46 | .78194 | .78289 | .78383 | .78477 | .78570 |
| 47 | .79128 | .79221 | .79313 | .79405 | .79496 |
| 48 | .80043 | .80133 | .80223 | .80313 | .80403 |
| 49 | .80938 | .81027 | .81115 | .81203 | .81291 |
| 50 | .81816 | .81902 | .81989 | .82075 | .82162 |
| 51 | .82676 | .82761 | .82846 | .82930 | .83015 |
| 52 | .83519 | .83602 | .83686 | .83769 | .83852 |
| 53 | .84346 | .84428 | .84510 | .84591 | .84673 |
| 54 | .85158 | .85238 | .85319 | .85399 | .85479 |
| 55 | .85955 | .86034 | .86113 | .86191 | .86270 |
| 56 | .86737 | .86815 | .86892 | .86969 | .87047 |
| 57 | .87506 | .87582 | .87658 | .87734 | .87810 |
| 58 | .88261 | .88336 | .88411 | .88486 | .88560 |
| 59 | .89004 | .89077 | .89151 | .89224 | .89297 |
| 60 | .89734 | .89806 | .89878 | .89950 | .90022 |
| 61 | .90452 | .90523 | .90594 | .90665 | .90735 |
| 62 | .91158 | .91228 | .91298 | .91367 | .91437 |
| 63 | .91853 | .91922 | .91990 | .92059 | .92128 |
| 64 | .92537 | .92604 | .92672 | .92740 | .92807 |
| 65 | .93210 | .93277 | .93343 | .93410 | .93476 |
| 66 | .93873 | .93939 | .94004 | .94070 | .94135 |
| 67 | .94526 | .94591 | .94656 | .94720 | .94785 |
| 68 | .95170 | .95233 | .95297 | .95361 | .35424 |
| 69 | .95804 | .95866 | .95929 | .95992 | .96055 |

| Centimetres. | Millimetres. | | | | |
|---|---|---|---|---|---|
| | 5 | 6 | 7 | 8 | 9 |
| 35 | 9.66941 | 9.67064 | 9.67185 | 9.67307 | 9.67428 |
| 36 | .68148 | .68267 | .68385 | .68503 | .68621 |
| 37 | .69322 | .69437 | .69553 | .69668 | .69783 |
| 38 | .70465 | .70577 | .70690 | .70802 | .70914 |
| 39 | .71578 | .71688 | .71798 | .71907 | .72016 |
| 40 | .72664 | .72771 | .72878 | .72985 | .73091 |
| 41 | .73723 | .73828 | .73932 | .74036 | .74140 |
| 42 | .74758 | .74860 | .74961 | .75063 | .75164 |
| 43 | .75768 | .75867 | .75967 | .76066 | .76165 |
| 44 | .76755 | .76852 | .76949 | .77046 | .77143 |
| 45 | .77720 | .77815 | .77910 | .78005 | .78100 |
| 46 | .78664 | .78757 | .78850 | .78943 | .79036 |
| 47 | .79588 | .79679 | .79770 | .79861 | .79952 |
| 48 | .80493 | .80582 | .80672 | .80760 | .80850 |
| 49 | .81379 | .81467 | .81554 | .81642 | .81729 |
| 50 | .82248 | .82334 | .82419 | .82505 | .82590 |
| 51 | .83099 | .83184 | .83268 | .83352 | .83435 |
| 52 | .83935 | .84017 | .84100 | .84182 | .84264 |
| 53 | .84754 | .84835 | .84916 | .84997 | .85078 |
| 54 | .85558 | .85638 | .85717 | .85797 | .85876 |
| 55 | .86348 | .86426 | .86504 | .86582 | .86660 |
| 56 | .87123 | .87200 | .87277 | .87353 | .87430 |
| 57 | .87885 | .87961 | .88036 | .88111 | .81870 |
| 58 | .88634 | .88708 | .88782 | .88856 | .88930 |
| 59 | .89370 | .89443 | .89516 | .89589 | .89661 |
| 60 | .90094 | .90166 | .90238 | .90309 | .90380 |
| 61 | .90806 | .90877 | .90947 | .91017 | .91088 |
| 62 | .91507 | .91576 | .91645 | .91715 | .91784 |
| 63 | .92196 | .92264 | .92333 | .92401 | .92469 |
| 64 | .92875 | .92942 | .93009 | .93076 | .93143 |
| 65 | .93543 | .93609 | .93675 | .93741 | .93807 |
| 66 | .94201 | .94266 | .94331 | .94396 | .94461 |
| 67 | .94849 | .94913 | .94978 | .95042 | .95106 |
| 68 | .95488 | .95551 | .95614 | .95677 | .95741 |
| 69 | .96117 | .96180 | .96242 | .96304 | .96366 |

## BAROMETRICAL CORRECTION. LOGARITHMS OF $\frac{h}{760}$.

| Millimetres. | Tenths of Millimetres. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 700 | 9.96428 | 434 | 441 | 447 | 453 | 459 | 465 | 472 | 478 | 484 |
| 701 | 490 | 496 | 503 | 509 | 515 | 521 | 527 | 534 | 540 | 546 |
| 702 | 552 | 558 | 565 | 571 | 577 | 583 | 589 | 596 | 602 | 608 |
| 703 | 614 | 620 | 626 | 632 | 639 | 645 | 651 | 657 | 663 | 670 |
| 704 | 676 | 682 | 688 | 694 | 701 | 707 | 713 | 719 | 725 | 731 |
| 705 | 737 | 743 | 749 | 755 | 762 | 768 | 774 | 780 | 786 | 793 |
| 706 | 799 | 805 | 811 | 817 | 823 | 829 | 836 | 842 | 848 | 854 |
| 707 | 860 | 866 | 872 | 878 | 884 | 890 | 896 | 903 | 909 | 915 |
| 708 | 922 | 928 | 934 | 940 | 946 | 952 | 958 | 964 | 970 | 976 |
| 709 | 982 | 988 | 994 | *001 | *007 | *013 | *019 | *025 | *021 | *038 |
| 710 | 9.97044 | 050 | 056 | 062 | 068 | 074 | 081 | 087 | 093 | 099 |
| 711 | 105 | 111 | 117 | 124 | 130 | 136 | 142 | 148 | 154 | 160 |
| 712 | 166 | 172 | 178 | 185 | 191 | 197 | 203 | 209 | 215 | 221 |
| 713 | 227 | 233 | 239 | 246 | 252 | 258 | 264 | 270 | 276 | 282 |
| 714 | 288 | 294 | 300 | 307 | 313 | 319 | 325 | 331 | 337 | 343 |
| 715 | 349 | 355 | 361 | 367 | 373 | 379 | 385 | 391 | 397 | 404 |
| 716 | 410 | 416 | 422 | 428 | 434 | 440 | 446 | 452 | 458 | 464 |
| 717 | 470 | 476 | 482 | 488 | 494 | 500 | 506 | 513 | 519 | 525 |
| 718 | 531 | 537 | 543 | 549 | 555 | 561 | 567 | 573 | 579 | 585 |
| 719 | 591 | 597 | 603 | 609 | 615 | 621 | 627 | 633 | 639 | 645 |
| 720 | 651 | 657 | 663 | 669 | 675 | 681 | 687 | 693 | 699 | 705 |
| 721 | 711 | 717 | 723 | 729 | 735 | 742 | 748 | 754 | 760 | 766 |
| 722 | 772 | 778 | 784 | 790 | 796 | 802 | 808 | 814 | 820 | 826 |
| 723 | 832 | 838 | 844 | 850 | 856 | 862 | 868 | 874 | 880 | 886 |
| 724 | 892 | 898 | 904 | 910 | 916 | 922 | 928 | 934 | 940 | 946 |
| 725 | 952 | 958 | 964 | 970 | 976 | 982 | 988 | 994 | *000 | *006 |
| 726 | 9.98012 | 018 | 024 | 030 | 036 | 042 | 048 | 054 | 060 | 066 |
| 727 | 072 | 078 | 084 | 090 | 096 | 102 | 108 | 114 | 120 | 126 |
| 728 | 132 | 138 | 144 | 150 | 156 | 162 | 168 | 173 | 179 | 185 |
| 729 | 191 | 197 | 203 | 209 | 215 | 221 | 227 | 233 | 239 | 245 |
| 730 | 251 | 257 | 263 | 269 | 275 | 280 | 286 | 292 | 298 | 304 |
| 731 | 310 | 316 | 322 | 328 | 334 | 340 | 346 | 352 | 358 | 364 |
| 732 | 370 | 376 | 381 | 387 | 393 | 399 | 405 | 411 | 417 | 423 |
| 733 | 429 | 435 | 441 | 447 | 453 | 458 | 464 | 470 | 476 | 482 |
| 734 | 488 | 494 | 500 | 506 | 512 | 518 | 524 | 530 | 535 | 541 |
| 735 | 547 | 553 | 559 | 565 | 571 | 577 | 583 | 589 | 595 | 601 |
| 736 | 607 | 612 | 618 | 624 | 630 | 636 | 642 | 648 | 653 | 659 |
| 737 | 665 | 671 | 677 | 683 | 689 | 695 | 701 | 706 | 712 | 718 |
| 738 | 724 | 730 | 736 | 742 | 748 | 754 | 760 | 765 | 771 | 777 |
| 739 | 783 | 789 | 795 | 801 | 806 | 812 | 818 | 824 | 830 | 836 |

| Milli-metres. | Tenths of Millimetres. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 740 | 9.98842 | 848 | 854 | 860 | 866 | 872 | 877 | 883 | 889 | 895 |
| 741 | 901 | 907 | 913 | 918 | 924 | 930 | 936 | 942 | 948 | 954 |
| 742 | 959 | 965 | 971 | 977 | 983 | 989 | 994 | *000 | *006 | *012 |
| 743 | 9.99018 | 024 | 030 | 035 | 041 | 047 | 053 | 059 | 065 | 070 |
| 744 | 076 | 082 | 088 | 094 | 100 | 105 | 111 | 117 | 123 | 129 |
| 745 | 135 | 140 | 146 | 152 | 158 | 164 | 170 | 175 | 181 | 187 |
| 746 | 193 | 199 | 205 | 210 | 216 | 222 | 228 | 234 | 239 | 245 |
| 747 | 251 | 257 | 263 | 268 | 274 | 280 | 286 | 292 | 298 | 303 |
| 748 | 309 | 315 | 321 | 327 | 332 | 338 | 344 | 350 | 356 | 361 |
| 749 | 367 | 373 | 379 | 385 | 390 | 396 | 402 | 408 | 414 | 419 |
| 750 | 425 | 431 | 437 | 442 | 448 | 454 | 460 | 466 | 471 | 477 |
| 751 | 483 | 489 | 495 | 500 | 506 | 512 | 518 | 523 | 529 | 535 |
| 752 | 541 | 547 | 552 | 558 | 564 | 570 | 575 | 581 | 587 | 593 |
| 753 | 598 | 604 | 610 | 616 | 622 | 627 | 633 | 639 | 645 | 650 |
| 754 | 656 | 662 | 668 | 673 | 679 | 685 | 691 | 696 | 702 | 708 |
| 755 | 714 | 719 | 725 | 731 | 737 | 742 | 748 | 754 | 760 | 765 |
| 756 | 771 | 777 | 783 | 788 | 794 | 800 | 806 | 811 | 817 | 823 |
| 757 | 829 | 834 | 840 | 846 | 852 | 857 | 863 | 869 | 874 | 880 |
| 758 | 886 | 892 | 897 | 903 | 909 | 915 | 920 | 926 | 932 | 937 |
| 759 | 943 | 949 | 955 | 960 | 966 | 972 | 977 | 983 | 989 | 995 |
| 760 | 0.00000 | 006 | 012 | 017 | 023 | 029 | 035 | 040 | 046 | 052 |
| 761 | 057 | 063 | 069 | 075 | 080 | 086 | 092 | 097 | 103 | 109 |
| 762 | 114 | 120 | 126 | 132 | 137 | 143 | 149 | 154 | 160 | 166 |
| 763 | 171 | 177 | 183 | 189 | 194 | 200 | 206 | 211 | 217 | 223 |
| 764 | 228 | 234 | 240 | 245 | 251 | 257 | 262 | 268 | 274 | 279 |
| 765 | 285 | 291 | 296 | 302 | 308 | 314 | 319 | 325 | 331 | 336 |
| 766 | 342 | 348 | 353 | 359 | 365 | 370 | 376 | 382 | 387 | 393 |
| 767 | 399 | 404 | 410 | 416 | 421 | 427 | 432 | 438 | 444 | 449 |
| 768 | 455 | 461 | 466 | 472 | 478 | 483 | 489 | 495 | 500 | 506 |
| 769 | 512 | 517 | 523 | 529 | 534 | 540 | 546 | 551 | 557 | 562 |
| 770 | 568 | 573 | 579 | 584 | 590 | 596 | 601 | 607 | 612 | 618 |
| 771 | 624 | 629 | 635 | 641 | 646 | 652 | 657 | 663 | 669 | 674 |
| 772 | 680 | 686 | 691 | 697 | 703 | 708 | 714 | 719 | 725 | 731 |
| 773 | 736 | 742 | 747 | 753 | 758 | 764 | 770 | 776 | 781 | 787 |
| 774 | 793 | 798 | 804 | 809 | 815 | 821 | 826 | 832 | 837 | 843 |
| 775 | 849 | 854 | 860 | 865 | 871 | 877 | 882 | 888 | 894 | 899 |
| 776 | 905 | 910 | 916 | 921 | 927 | 934 | 938 | 944 | 949 | 955 |
| 777 | 961 | 966 | 972 | 978 | 983 | 989 | 994 | *000 | *006 | *011 |
| 778 | 0.01017 | 022 | 028 | 033 | 039 | 044 | 050 | 056 | 061 | 067 |
| 779 | 072 | 078 | 083 | 089 | 095 | 100 | 106 | 111 | 117 | 123 |
| 780 | 128 | 134 | 139 | 145 | 150 | 156 | 162 | 167 | 173 | 178 |

## TABLE OF LOG $\frac{1}{1+0.00367t}$.

| t | Tenths of Degrees. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 0° | | 984 | 968 | 952 | 936 | 920 | 904 | 888 | 872 | 857 |
| 1 | 9.99841 | 825 | 809 | 793 | 777 | 762 | 746 | 730 | 714 | 698 |
| 2 | 683 | 667 | 651 | 635 | 619 | 604 | 588 | 572 | 556 | 541 |
| 3 | 525 | 509 | 493 | 478 | 462 | 446 | 430 | 415 | 399 | 383 |
| 4 | 368 | 352 | 336 | 321 | 305 | 289 | 274 | 258 | 242 | 227 |
| 5 | 211 | 196 | 180 | 164 | 149 | 133 | 117 | 102 | 086 | 071 |
| 6 | 055 | 040 | 024 | 008 | *993 | *977 | *962 | *946 | *931 | *915 |
| 7 | 9.98900 | 884 | 869 | 853 | 838 | 822 | 807 | 791 | 776 | 760 |
| 8 | 745 | 729 | 714 | 698 | 683 | 668 | 652 | 637 | 621 | 606 |
| 9 | 590 | 575 | 560 | 544 | 529 | 514 | 498 | 483 | 467 | 452 |
| 10 | 437 | 421 | 406 | 391 | 375 | 360 | 345 | 329 | 314 | 299 |
| 11 | 283 | 268 | 253 | 238 | 222 | 207 | 192 | 177 | 161 | 146 |
| 12 | 131 | 116 | 100 | 085 | 070 | 055 | 039 | 024 | 009 | *994 |
| 13 | 9.97979 | 963 | 948 | 933 | 918 | 903 | 888 | 872 | 857 | 842 |
| 14 | 827 | 812 | 797 | 782 | 766 | 751 | 736 | 721 | 706 | 691 |
| 15 | 676 | 661 | 646 | 631 | 616 | 600 | 585 | 570 | 555 | 540 |
| 16 | 525 | 510 | 495 | 480 | 465 | 450 | 435 | 420 | 405 | 390 |
| 17 | 375 | 360 | 345 | 330 | 315 | 300 | 285 | 270 | 255 | 241 |
| 18 | 226 | 211 | 196 | 181 | 166 | 151 | 136 | 121 | 106 | 091 |
| 19 | 076 | 062 | 047 | 032 | 017 | 002 | *987 | *972 | *958 | *943 |
| 20 | 9.96928 | 913 | 898 | 883 | 869 | 854 | 839 | 824 | 809 | 795 |
| 21 | 780 | 765 | 750 | 735 | 721 | 706 | 691 | 676 | 662 | 647 |
| 22 | 632 | 618 | 603 | 588 | 573 | 559 | 544 | 529 | 515 | 500 |
| 23 | 485 | 471 | 456 | 441 | 426 | 412 | 397 | 383 | 368 | 353 |
| 24 | 339 | 324 | 309 | 295 | 280 | 266 | 251 | 237 | 222 | 207 |
| 25 | 188 | 174 | 159 | 145 | 130 | 116 | 101 | 087 | 072 | 057 |
| 26 | 042 | 028 | 013 | *999 | *984 | *970 | *955 | *941 | *926 | *912 |
| 27 | 9.95897 | 883 | 868 | 854 | 839 | 825 | 810 | 796 | 781 | 767 |
| 28 | 752 | 738 | 723 | 709 | 694 | 680 | 665 | 651 | 636 | 622 |
| 29 | 607 | 593 | 578 | 564 | 549 | 535 | 520 | 506 | 491 | 477 |
| 30 | 463 | 449 | 434 | 420 | 406 | 391 | 377 | 363 | 348 | 334 |
| 31 | 320 | 306 | 292 | 277 | 263 | 249 | 234 | 220 | 206 | 191 |
| 32 | 177 | 163 | 149 | 134 | 120 | 106 | 092 | 078 | 063 | 049 |
| 33 | 035 | 021 | 007 | *993 | *978 | *964 | *950 | *935 | *921 | *907 |
| 34 | 9.94893 | 879 | 865 | 851 | 837 | 822 | 808 | 794 | 780 | 766 |

| t | Tenths of Degrees. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 35° | 9.94752 | 738 | 724 | 710 | 695 | 681 | 667 | 653 | 639 | 625 |
| 36 | 611 | 597 | 583 | 569 | 554 | 540 | 526 | 512 | 498 | 484 |
| 37 | 470 | 456 | 442 | 428 | 414 | 400 | 386 | 372 | 358 | 344 |
| 38 | 330 | 316 | 302 | 288 | 274 | 260 | 246 | 232 | 218 | 204 |
| 39 | 190 | 176 | 162 | 148 | 134 | 121 | 107 | 093 | 079 | 065 |
| 40 | 051 | 037 | 023 | 009 | *996 | *982 | *968 | *954 | *940 | *926 |
| 41 | 9.93912 | 898 | 884 | 871 | 857 | 843 | 829 | 816 | 802 | 788 |
| 42 | 774 | 760 | 746 | 733 | 719 | 705 | 692 | 678 | 665 | 651 |
| 43 | 637 | 623 | 609 | 595 | 582 | 568 | 554 | 540 | 527 | 513 |
| 44 | 499 | 485 | 471 | 458 | 444 | 430 | 417 | 403 | 390 | 376 |
| 45 | 362 | 348 | 334 | 321 | 307 | 293 | 279 | 266 | 253 | 239 |
| 46 | 225 | 211 | 198 | 184 | 171 | 158 | 144 | 131 | 117 | 103 |
| 47 | 089 | 075 | 062 | 048 | 035 | 021 | 007 | *994 | *980 | *967 |
| 48 | 9.92953 | 940 | 926 | 913 | 899 | 885 | 871 | 858 | 844 | 831 |
| 49 | 818 | 804 | 791 | 777 | 764 | 750 | 737 | 723 | 710 | 696 |
| 50 | 683 | 670 | 656 | 643 | 629 | 616 | 603 | 589 | 576 | 562 |
| 51 | 549 | 536 | 522 | 509 | 496 | 482 | 469 | 455 | 442 | 428 |
| 52 | 415 | 402 | 388 | 375 | 361 | 348 | 335 | 321 | 308 | 294 |
| 53 | 281 | 268 | 254 | 240 | 227 | 214 | 200 | 187 | 173 | 160 |
| 54 | 147 | 134 | 120 | 107 | 094 | 080 | 067 | 054 | 040 | 027 |
| 55 | 014 | 001 | *988 | *974 | *961 | *948 | *935 | *921 | *908 | *895 |
| 56 | 9.91882 | 869 | 856 | 842 | 829 | 816 | 803 | 790 | 776 | 763 |
| 57 | 750 | 737 | 724 | 711 | 698 | 684 | 671 | 658 | 645 | 632 |
| 58 | 619 | 606 | 593 | 580 | 567 | 553 | 540 | 527 | 514 | 501 |
| 59 | 488 | 475 | 462 | 449 | 436 | 422 | 409 | 396 | 383 | 370 |
| 60 | 357 | 344 | 331 | 318 | 305 | 292 | 279 | 266 | 253 | 240 |
| 61 | 227 | 214 | 201 | 188 | 175 | 162 | 149 | 136 | 123 | 110 |
| 62 | 097 | 084 | 071 | 058 | 045 | 032 | 019 | 006 | *993 | *980 |
| 63 | 9.90967 | 954 | 941 | 928 | 915 | 902 | 889 | 876 | 863 | 851 |
| 64 | 838 | 825 | 812 | 799 | 786 | 773 | 760 | 747 | 735 | 722 |
| 65 | 709 | 696 | 683 | 670 | 657 | 644 | 632 | 619 | 606 | 593 |
| 66 | 580 | 567 | 554 | 542 | 529 | 516 | 503 | 490 | 478 | 465 |
| 67 | 452 | 439 | 426 | 414 | 401 | 388 | 375 | 363 | 350 | 337 |
| 68 | 324 | 311 | 298 | 286 | 273 | 260 | 248 | 235 | 223 | 210 |
| 69 | 197 | 184 | 172 | 159 | 146 | 134 | 121 | 108 | 096 | 083 |
| 70 | 070 | 057 | 044 | 032 | 019 | 006 | *993 | *980 | *968 | *956 |
| 71 | 9.89943 | 930 | 918 | 905 | 893 | 880 | 867 | 855 | 842 | 830 |
| 72 | 817 | 805 | 792 | 780 | 767 | 755 | 742 | 730 | 717 | 704 |
| 73 | 691 | 679 | 666 | 654 | 641 | 628 | 616 | 603 | 591 | 578 |
| 74 | 565 | 553 | 540 | 528 | 515 | 503 | 490 | 478 | 465 | 453 |

| t | Tenths of Degrees. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| ° | | | | | | | | | | |
| 75 | 9.89440 | 428 | 415 | 403 | 390 | 378 | 366 | 353 | 341 | 328 |
| 76 | 316 | 304 | 291 | 279 | 266 | 254 | 241 | 229 | 216 | 204 |
| 77 | 91 | 179 | 166 | 154 | 141 | 129 | 117 | 104 | 092 | 079 |
| 78 | 067 | 054 | 042 | 029 | 017 | 005 | *992 | *980 | *967 | *955 |
| 79 | 9.88943 | 931 | 919 | 906 | 894 | 882 | 869 | 857 | 845 | 833 |
| 80 | 820 | 808 | 796 | 783 | 771 | 759 | 747 | 734 | 722 | 710 |
| 81 | 697 | 685 | 673 | 661 | 648 | 636 | 624 | 612 | 599 | 587 |
| 82 | 574 | 562 | 550 | 538 | 525 | 513 | 501 | 489 | 477 | 464 |
| 83 | 452 | 440 | 428 | 416 | 403 | 391 | 379 | 367 | 354 | 342 |
| 84 | 330 | 318 | 306 | 294 | 282 | 269 | 257 | 245 | 233 | 221 |
| 85 | 209 | 197 | 185 | 173 | 160 | 148 | 136 | 124 | 111 | 099 |
| 86 | 087 | 075 | 063 | 051 | 039 | 026 | 014 | 002 | *990 | *978 |
| 87 | 9.87966 | 954 | 942 | 930 | 918 | 905 | 893 | 881 | 869 | 857 |
| 88 | 845 | 833 | 821 | 809 | 797 | 785 | 773 | 761 | 749 | 737 |
| 89 | 725 | 713 | 701 | 689 | 677 | 665 | 653 | 641 | 629 | 617 |
| 90 | 605 | 593 | 581 | 569 | 557 | 545 | 533 | 521 | 509 | 497 |
| 91 | 485 | 473 | 461 | 449 | 437 | 426 | 414 | 402 | 390 | 378 |
| 92 | 366 | 354 | 342 | 330 | 318 | 306 | 295 | 283 | 271 | 259 |
| 93 | 247 | 235 | 223 | 212 | 200 | 188 | 176 | 165 | 153 | 141 |
| 94 | 129 | 117 | 105 | 093 | 081 | 070 | 058 | 046 | 034 | 022 |
| 95 | 010 | *998 | *986 | *975 | *963 | *951 | *939 | *928 | *916 | *904 |
| 96 | 9.86892 | 880 | 868 | 857 | 845 | 833 | 821 | 809 | 798 | 786 |
| 97 | 774 | 762 | 750 | 739 | 727 | 715 | 704 | 692 | 680 | 669 |
| 98 | 657 | 645 | 633 | 621 | 610 | 598 | 586 | 574 | 563 | 551 |
| 99 | 539 | 527 | 516 | 504 | 493 | 481 | 469 | 458 | 446 | 435 |
| 100 | 423 | 412 | 400 | 389 | 378 | 366 | 355 | 343 | 331 | 319 |
| 101 | 307 | 296 | 284 | 273 | 261 | 249 | 238 | 226 | 214 | 203 |
| 102 | 191 | 179 | 168 | 156 | 145 | 133 | 121 | 110 | 098 | 087 |
| 103 | 075 | 063 | 052 | 040 | 029 | 017 | 005 | *994 | *982 | *971 |
| 104 | 9.85959 | 948 | 936 | 925 | 913 | 902 | 890 | 879 | 867 | 856 |
| 105 | 844 | 833 | 821 | 810 | 798 | 787 | 775 | 764 | 752 | 741 |
| 106 | 729 | 718 | 706 | 695 | 683 | 672 | 661 | 649 | 638 | 626 |
| 107 | 615 | 603 | 592 | 580 | 569 | 557 | 546 | 534 | 523 | 511 |
| 108 | 500 | 488 | 477 | 465 | 454 | 443 | 431 | 420 | 408 | 397 |
| 109 | 386 | 374 | 363 | 351 | 340 | 329 | 317 | 306 | 295 | 283 |
| 110 | 272 | 261 | 249 | 238 | 227 | 215 | 204 | 193 | 181 | 170 |
| 111 | 159 | 148 | 136 | 125 | 114 | 102 | 091 | 080 | 069 | 057 |
| 112 | 046 | 035 | 023 | 012 | 001 | *989 | *978 | *967 | *955 | *944 |
| 113 | 9.84933 | 922 | 911 | 899 | 888 | 877 | 866 | 854 | 843 | 832 |
| 114 | 821 | 810 | 799 | 787 | 776 | 765 | 754 | 742 | 731 | 720 |

| t | Tenths of Degrees. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 115° | 9.84709 | 698 | 687 | 675 | 664 | 653 | 642 | 630 | 619 | 608 |
| 116 | 597 | 586 | 575 | 563 | 552 | 541 | 530 | 518 | 507 | 496 |
| 117 | 485 | 474 | 463 | 451 | 440 | 429 | 418 | 407 | 395 | 384 |
| 118 | 373 | 362 | 351 | 340 | 329 | 317 | 306 | 295 | 284 | 273 |
| 119 | 262 | 251 | 240 | 229 | 218 | 207 | 196 | 185 | 174 | 163 |
| 120 | 152 | 141 | 130 | 119 | 107 | 096 | 085 | 074 | 063 | 052 |
| 121 | 041 | 030 | 019 | 008 | *997 | *985 | *974 | *963 | *952 | *941 |
| 122 | 9.83931 | 920 | 909 | 898 | 887 | 876 | 865 | 854 | 843 | 832 |
| 123 | 821 | 810 | 799 | 788 | 777 | 766 | 756 | 745 | 734 | 723 |
| 124 | 712 | 701 | 690 | 679 | 668 | 657 | 646 | 635 | 624 | 613 |
| 125 | 602 | 591 | 580 | 569 | 558 | 547 | 536 | 525 | 514 | 503 |
| 126 | 493 | 482 | 471 | 460 | 449 | 438 | 428 | 417 | 406 | 395 |
| 127 | 384 | 373 | 362 | 351 | 340 | 329 | 319 | 308 | 297 | 286 |
| 128 | 275 | 264 | 253 | 243 | 232 | 221 | 210 | 200 | 189 | 178 |
| 129 | 167 | 156 | 145 | 135 | 124 | 113 | 102 | 091 | 081 | 070 |
| 130 | 059 | 048 | 037 | 027 | 016 | 005 | *994 | *984 | *973 | *962 |
| 131 | 9.82951 | 940 | 929 | 919 | 908 | 897 | 886 | 876 | 865 | 854 |
| 132 | 844 | 833 | 822 | 812 | 801 | 790 | 779 | 769 | 758 | 747 |
| 133 | 737 | 726 | 715 | 705 | 694 | 683 | 672 | 662 | 651 | 640 |
| 134 | 630 | 619 | 608 | 598 | 587 | 576 | .565 | 554 | 544 | 533 |
| 135 | 523 | 512 | 501 | 491 | 480 | 469 | 458 | 448 | 437 | 426 |
| 136 | 416 | 405 | 395 | 384 | 373 | 363 | 352 | 342 | 331 | 320 |
| 137 | 310 | 299 | 289 | 278 | 267 | 257 | 246 | 235 | 225 | 214 |
| 138 | 204 | 193 | 183 | 172 | 162 | 151 | 141 | 130 | 120 | 109 |
| 139 | 099 | 088 | 078 | 067 | 057 | 046 | 035 | 025 | 014 | 004 |
| 140 | 9.81993 | 983 | 972 | 961 | 951 | 940 | 929 | 919 | 908 | 898 |
| 141 | 888 | 877 | 867 | 856 | 846 | 835 | 825 | 814 | 804 | 793 |
| 142 | 783 | 772 | 762 | 751 | 741 | 730 | 720 | 709 | 699 | 688 |
| 143 | 678 | 667 | 657 | 646 | 636 | 626 | 615 | 605 | 594 | 584 |
| 144 | 574 | 564 | 553 | 543 | 533 | 522 | 512 | 501 | 491 | 480 |
| 145 | 470 | 460 | 449 | 439 | 428 | 418 | 408 | 397 | 387 | 376 |
| 146 | 366 | 356 | 345 | 335 | 324 | 314 | 303 | 293 | 283 | 272 |
| 147 | 262 | 252 | 241 | 231 | 220 | 210 | 200 | 189 | 179 | 168 |
| 148 | 158 | 148 | 138 | 127 | 117 | 107 | 096 | 086 | 075 | 065 |
| 149 | 055 | 045 | 035 | 025 | 014 | 004 | *994 | *984 | *973 | *963 |
| 150 | 9.80953 | 943 | 932 | 922 | 911 | 901 | 891 | 881 | 871 | 860 |
| 151 | 850 | 840 | 830 | 819 | 809 | 799 | 789 | 779 | 768 | 758 |
| 152 | 748 | 738 | 728 | 717 | 707 | 697 | 687 | 677 | 667 | 656 |
| 153 | 646 | 636 | 626 | 615 | 605 | 595 | 585 | 575 | 565 | 554 |
| 154 | 544 | 534 | 524 | 514 | 503 | 493 | 483 | 473 | 463 | 452 |

| t | Tenths of Degrees. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 155° | 9.80442 | 432 | 422 | 412 | 402 | 391 | 381 | 471 | 361 | 351 |
| 156 | 340 | 330 | 320 | 310 | 300 | 289 | 279 | 269 | 259 | 249 |
| 157 | 239 | 229 | 219 | 209 | 199 | 189 | 178 | 168 | 158 | 148 |
| 158 | 138 | 128 | 118 | 108 | 098 | 088 | 078 | 067 | 057 | 047 |
| 159 | 037 | 027 | 017 | 007 | *997 | *987 | *977 | *967 | *957 | *947 |
| 160 | 9.79937 | 927 | 917 | 907 | 897 | 887 | 877 | 867 | 857 | 847 |
| 161 | 837 | 827 | 817 | 807 | 797 | 787 | 777 | 767 | 757 | 747 |
| 162 | 737 | 727 | 717 | 707 | 697 | 687 | 677 | 667 | 657 | 647 |
| 163 | 637 | 627 | 617 | 607 | 597 | 587 | 577 | 567 | 557 | 547 |
| 164 | 537 | 527 | 517 | 507 | 497 | 487 | 477 | 467 | 457 | 447 |
| 165 | 437 | 427 | 417 | 407 | 397 | 388 | 378 | 368 | 358 | 348 |
| 166 | 338 | 328 | 318 | 309 | 299 | 289 | 279 | 270 | 260 | 250 |
| 167 | 240 | 230 | 220 | 210 | 200 | 191 | 181 | 171 | 161 | 151 |
| 168 | 141 | 131 | 121 | 111 | 102 | 092 | 082 | 072 | 062 | 052 |
| 169 | 042 | 032 | 022 | 013 | 003 | *993 | *983 | *973 | *964 | *954 |
| 170 | 9.78944 | 934 | 925 | 915 | 905 | 895 | 885 | 876 | 866 | 856 |
| 171 | 846 | 836 | 827 | 817 | 807 | 797 | 787 | 777 | 768 | 758 |
| 172 | 748 | 738 | 729 | 719 | 709 | 699 | 689 | 680 | 670 | 660 |
| 173 | 650 | 640 | 731 | 621 | 611 | 602 | 592 | 582 | 572 | 563 |
| 174 | 553 | 543 | 533 | 524 | 514 | 504 | 494 | 485 | 475 | 466 |
| 175 | 456 | 446 | 437 | 427 | 417 | 408 | 398 | 389 | 379 | 370 |
| 176 | 360 | 350 | 341 | 331 | 321 | 312 | 302 | 292 | 283 | 273 |
| 177 | 263 | 253 | 244 | 234 | 224 | 215 | 205 | 195 | 185 | 176 |
| 178 | 166 | 156 | 147 | 137 | 128 | 118 | 108 | 099 | 089 | 080 |
| 179 | 070 | 060 | 051 | 041 | 031 | 022 | 012 | 002 | *993 | *983 |
| 180 | 9.77973 | 964 | 954 | 945 | 935 | 926 | 916 | 906 | 897 | 887 |
| 181 | 878 | 868 | 859 | 849 | 840 | 830 | 821 | 811 | 801 | 792 |
| 182 | 782 | 772 | 763 | 753 | 743 | 734 | 724 | 715 | 705 | 696 |
| 183 | 686 | 677 | 667 | 658 | 648 | 639 | 629 | 620 | 610 | 601 |
| 184 | 591 | 582 | 572 | 563 | 553 | 544 | 534 | 525 | 515 | 506 |
| 185 | 496 | 487 | 477 | 468 | 458 | 449 | 439 | 430 | 420 | 411 |
| 186 | 402 | 392 | 383 | 373 | 364 | 354 | 345 | 335 | 326 | 316 |
| 187 | 307 | 297 | 288 | 278 | 269 | 259 | 250 | 240 | 231 | 221 |
| 188 | 212 | 202 | 193 | 183 | 174 | 164 | 155 | 146 | 136 | 127 |
| 189 | 118 | 108 | 099 | 089 | 080 | 071 | 061 | 052 | 043 | 033 |
| 190 | 024 | 014 | 005 | *996 | *986 | *977 | *968 | *958 | *949 | *940 |
| 191 | 9.76931 | 921 | 912 | 903 | 893 | 884 | 875 | 865 | 856 | 847 |
| 192 | 837 | 828 | 818 | 809 | 799 | 790 | 781 | 771 | 762 | 753 |
| 193 | 743 | 734 | 725 | 715 | 706 | 697 | 687 | 678 | 669 | 659 |
| 194 | 650 | 640 | 631 | 622 | 612 | 603 | 594 | 585 | 575 | 566 |

| t | Tenths of Degrees. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 195 | 9.76557 | 547 | 538 | 529 | 519 | 510 | 501 | 492 | 482 | 473 |
| 196 | 464 | 455 | 445 | 436 | 427 | 417 | 408 | 399 | 390 | 380 |
| 197 | 371 | 362 | 352 | 343 | 334 | 325 | 316 | 306 | 297 | 288 |
| 198 | 279 | 270 | 260 | 251 | 242 | 233 | 224 | 215 | 205 | 196 |
| 199 | 187 | 178 | 169 | 159 | 150 | 141 | 132 | 123 | 113 | 104 |
| 200 | 095 | 086 | 077 | 067 | 058 | 049 | 040 | 031 | 021 | 012 |
| 201 | 003 | *994 | *985 | *975 | *966 | *957 | *948 | *939 | *930 | *920 |
| 202 | 9.75911 | 902 | 893 | 884 | 875 | 865 | 856 | 847 | 838 | 829 |
| 203 | 820 | 811 | 802 | 793 | 784 | 774 | 765 | 756 | 747 | 738 |
| 204 | 729 | 720 | 711 | 702 | 693 | 683 | 674 | 665 | 656 | 647 |
| 205 | 638 | 629 | 620 | 611 | 602 | 592 | 583 | 573 | 565 | 556 |
| 206 | 547 | 538 | 529 | 520 | 511 | 501 | 492 | 483 | 474 | 465 |
| 207 | 456 | 447 | 438 | 429 | 420 | 411 | 402 | 393 | 384 | 375 |
| 208 | 366 | 357 | 348 | 339 | 330 | 320 | 311 | 302 | 293 | 284 |
| 209 | 275 | 266 | 257 | 248 | 239 | 230 | 221 | 212 | 203 | 194 |
| 210 | 185 | 176 | 167 | 158 | 149 | 140 | 131 | 122 | 113 | 104 |
| 211 | 095 | 086 | 077 | 068 | 059 | 050 | 042 | 033 | 024 | 015 |
| 212 | 006 | *997 | *988 | *979 | *970 | *961 | *953 | *944 | *935 | *926 |
| 213 | 9.74917 | 908 | 899 | 890 | 881 | 872 | 863 | 854 | 845 | 836 |
| 214 | 827 | 818 | 809 | 800 | 791 | 782 | 774 | 765 | 756 | 747 |
| 215 | 738 | 729 | 720 | 711 | 702 | 693 | 685 | 676 | 667 | 658 |
| 216 | 649 | 640 | 631 | 622 | 613 | 604 | 596 | 587 | 578 | 569 |
| 217 | 560 | 551 | 542 | 533 | 524 | 515 | 507 | 498 | 489 | 480 |
| 218 | 471 | 462 | 453 | 444 | 435 | 426 | 418 | 409 | 400 | 391 |
| 219 | 382 | 373 | 364 | 356 | 347 | 338 | 329 | 320 | 312 | 303 |
| 220 | 294 | 285 | 276 | 268 | 259 | 250 | 241 | 232 | 224 | 215 |
| 221 | 206 | 197 | 188 | 180 | 171 | 162 | 153 | 145 | 136 | 127 |
| 222 | 118 | 109 | 100 | 092 | 083 | 074 | 066 | 057 | 048 | 040 |
| 223 | 031 | 022 | 013 | 005 | *996 | *987 | *978 | *969 | *961 | *952 |
| 224 | 9.73943 | 934 | 926 | 917 | 908 | 900 | 891 | 882 | 874 | 865 |
| 225 | 856 | 847 | 839 | 830 | 821 | 813 | 804 | 795 | 787 | 778 |
| 226 | 769 | 760 | 752 | 743 | 734 | 726 | 717 | 708 | 700 | 691 |
| 227 | 682 | 673 | 665 | 656 | 647 | 639 | 630 | 621 | 613 | 604 |
| 228 | 595 | 586 | 578 | 569 | 560 | 552 | 543 | 534 | 526 | 517 |
| 229 | 508 | 499 | 491 | 482 | 474 | 465 | 456 | 447 | 439 | 430 |
| 230 | 422 | 413 | 405 | 396 | 387 | 379 | 370 | 361 | 353 | 344 |
| 231 | 335 | 326 | 318 | 309 | 301 | 292 | 283 | 275 | 266 | 258 |
| 232 | 249 | 240 | 232 | 223 | 215 | 206 | 197 | 189 | 180 | 172 |
| 233 | 163 | 154 | 146 | 137 | 129 | 120 | 111 | 103 | 094 | 086 |
| 234 | 077 | 068 | 060 | 051 | 043 | 034 | 026 | 017 | 009 | 000 |

| t | Tenths of Degrees. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 235° | 9.72992 | 983 | 975 | 966 | 958 | 949 | 940 | 932 | 923 | 915 |
| 236 | 906 | 898 | 889 | 881 | 873 | 864 | 856 | 847 | 839 | 830 |
| 237 | 821 | 813 | 804 | 796 | 787 | 779 | 770 | 762 | 753 | 745 |
| 238 | 736 | 728 | 719 | 711 | 702 | 694 | 685 | 677 | 668 | 660 |
| 239 | 651 | 643 | 634 | 626 | 617 | 609 | 600 | 592 | 583 | 575 |
| 240 | 566 | 558 | 549 | 541 | 532 | 524 | 515 | 507 | 498 | 490 |
| 241 | 481 | 473 | 464 | 456 | 447 | 439 | 431 | 422 | 414 | 405 |
| 242 | 397 | 388 | 380 | 371 | 363 | 354 | 346 | 338 | 329 | 321 |
| 243 | 313 | 304 | 296 | 287 | 279 | 271 | 262 | 254 | 245 | 237 |
| 244 | 229 | 221 | 212 | 204 | 195 | 187 | 179 | 170 | 162 | 153 |
| 245 | 145 | 137 | 128 | 120 | 111 | 103 | 095 | 086 | 078 | 069 |
| 246 | 061 | 053 | 044 | 036 | 027 | 019 | 011 | 002 | *994 | *985 |
| *247 | 9.71977 | 969 | 960 | 952 | 943 | 935 | 927 | 918 | 910 | 901 |
| 248 | 893 | 885 | 876 | 868 | 858 | 851 | 843 | 834 | 826 | 818 |
| 249 | 810 | 802 | 793 | 785 | 777 | 768 | 760 | 752 | 743 | 735 |
| 250 | 726 | 718 | 709 | 701 | 693 | 684 | 676 | 668 | 659 | 651 |
| 251 | 643 | 635 | 626 | 618 | 610 | 601 | 593 | 585 | 576 | 568 |
| 252 | 560 | 552 | 544 | 535 | 527 | 519 | 511 | 503 | 494 | 486 |
| 253 | 478 | 470 | 461 | 453 | 445 | 437 | 428 | 420 | 412 | 403 |
| 254 | 395 | 387 | 379 | 370 | 362 | 354 | 346 | 338 | 329 | 321 |
| 255 | 313 | 305 | 297 | 288 | 280 | 272 | 264 | 255 | 247 | 239 |
| 256 | 231 | 223 | 215 | 206 | 198 | 190 | 182 | 174 | 165 | 157 |
| 257 | 149 | 141 | 133 | 124 | 116 | 108 | 100 | 092 | 083 | 075 |
| 258 | 067 | 059 | 051 | 042 | 034 | 026 | 018 | 010 | 001 | *993 |
| 259 | 9.70985 | 977 | 969 | 960 | 952 | 944 | 936 | 928 | 919 | 911 |
| 260 | 903 | 895 | 887 | 878 | 870 | 862 | 854 | 846 | 838 | 830 |
| 261 | 822 | 814 | 806 | 797 | 789 | 781 | 773 | 765 | 756 | 748 |
| 262 | 740 | 732 | 724 | 716 | 708 | 699 | 691 | 683 | 675 | 667 |
| 263 | 659 | 651 | 643 | 635 | 627 | 618 | 610 | 602 | 594 | 586 |
| 264 | 578 | 570 | 562 | 554 | 546 | 538 | 530 | 521 | 513 | 505 |
| 265 | 497 | 489 | 481 | 473 | 465 | 457 | 448 | 440 | 432 | 424 |
| 266 | 416 | 408 | 400 | 392 | 384 | 375 | 367 | 359 | 351 | 343 |
| 267 | 335 | 327 | 319 | 311 | 303 | 295 | 287 | 279 | 271 | 263 |
| 268 | 255 | 247 | 239 | 231 | 223 | 215 | 207 | 199 | 191 | 183 |
| 269 | 175 | 167 | 159 | 151 | 143 | 135 | 127 | 119 | 111 | 103 |
| 270 | 095 | 087 | 079 | 071 | 063 | 055 | 047 | 039 | 031 | 023 |
| 271 | 015 | 007 | *999 | *991 | *983 | *975 | *967 | *959 | *951 | *943 |
| 272 | 9.69935 | 927 | 919 | 911 | 903 | 895 | 888 | 880 | 872 | 864 |
| 273 | 856 | 848 | 840 | 832 | 824 | 816 | 808 | 800 | 792 | 784 |
| 274 | 776 | 768 | 760 | 752 | 744 | 736 | 728 | 720 | 712 | 704 |

| t | Tenths of Degrees. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 275° | 9.69696 | 688 | 680 | 672 | 664 | 656 | 648 | 640 | 632 | 625 |
| 276 | 617 | 609 | 601 | 593 | 585 | 577 | 570 | 562 | 554 | 546 |
| 277 | 538 | 530 | 522 | 514 | 506 | 499 | 491 | 483 | 475 | 467 |
| 278 | 459 | 451 | 443 | 436 | 428 | 420 | 412 | 404 | 397 | 389 |
| 279 | 381 | 373 | 365 | 357 | 349 | 341 | 334 | 326 | 318 | 310 |
| 280 | 302 | 294 | 286 | 279 | 271 | 263 | 255 | 248 | 240 | 232 |
| 281 | 224 | 216 | 208 | 200 | 192 | 185 | 177 | 169 | 161 | 153 |
| 282 | 145 | 137 | 129 | 122 | 114 | 106 | 098 | 090 | 083 | 075 |
| 283 | 067 | 059 | 051 | 043 | 035 | 027 | 020 | 012 | 004 | *996 |
| 284 | 8.68988 | 980 | 972 | 965 | 957 | 949 | 941 | 933 | 926 | 918 |
| 285 | 910 | 902 | 895 | 887 | 879 | 871 | 864 | 856 | 848 | 841 |
| 286 | 833 | 825 | 817 | 810 | 802 | 794 | 786 | 778 | 771 | 763 |
| 287 | 755 | 747 | 740 | 732 | 724 | 716 | 709 | 701 | 693 | 686 |
| 288 | 678 | 670 | 662 | 655 | 647 | 639 | 631 | 623 | 616 | 608 |
| 289 | 600 | 592 | 585 | 577 | 569 | 561 | 554 | 546 | 538 | 531 |
| 290 | 523 | 515 | 508 | 500 | 492 | 484 | 477 | 469 | 461 | 454 |
| 291 | 446 | 438 | 431 | 423 | 415 | 407 | 399 | 392 | 384 | 377 |
| 292 | 369 | 361 | 354 | 346 | 338 | 330 | 323 | 315 | 307 | 300 |
| 293 | 292 | 284 | 277 | 269 | 261 | 253 | 246 | 238 | 230 | 223 |
| 294 | 215 | 207 | 200 | 192 | 184 | 176 | 169 | 161 | 153 | 146 |
| 295 | 138 | 130 | 123 | 115 | 107 | 100 | 092 | 085 | 077 | 070 |
| 296 | 062 | 054 | 047 | 039 | 031 | 023 | 016 | 008 | 000 | *993 |
| 297 | 9.67985 | 977 | 970 | 962 | 954 | 947 | 939 | 932 | 924 | 917 |
| 298 | 909 | 901 | 894 | 886 | 878 | 871 | 863 | 856 | 848 | 840 |
| 299 | 833 | 825 | 818 | 810 | 803 | 795 | 787 | 780 | 773 | 765 |
| 300 | 757 | 749 | 742 | 734 | 627 | 719 | 711 | 704 | 696 | 689 |
| 301 | 681 | 673 | 666 | 658 | 651 | 643 | 636 | 628 | 621 | 613 |
| 302 | 606 | 598 | 591 | 583 | 576 | 568 | 561 | 553 | 546 | 538 |
| 303 | 531 | 523 | 516 | 508 | 501 | 493 | 485 | 478 | 470 | 463 |
| 304 | 455 | 448 | 440 | 433 | 425 | 418 | 410 | 403 | 395 | 388 |
| 305 | 380 | 373 | 365 | 358 | 350 | 343 | 335 | 328 | 320 | 313 |
| 306 | 305 | 298 | 290 | 283 | 275 | 268 | 260 | 253 | 245 | 238 |
| 307 | 230 | 223 | 215 | 208 | 200 | 193 | 185 | 178 | 170 | 163 |
| 308 | 155 | 148 | 140 | 133 | 125 | 118 | 110 | 103 | 095 | 088 |
| 309 | 080 | 073 | 065 | 058 | 050 | 043 | 035 | 028 | 020 | 013 |
| 310 | 005 | *998 | *990 | *983 | *975 | *968 | *961 | *953 | *946 | *938 |
| 311 | 9.66931 | 923 | 916 | 908 | 901 | 893 | 886 | 878 | 871 | 863 |
| 312 | 856 | 848 | 841 | 834 | 826 | 819 | 812 | 804 | 797 | 789 |
| 313 | 782 | 774 | 767 | 759 | 752 | 744 | 737 | 730 | 722 | 715 |
| 314 | 708 | 700 | 693 | 685 | 678 | 671 | 663 | 656 | 648 | 641 |

| t | Tenths of Degrees. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 315° | 9.66634 | 626 | 619 | 612 | 604 | 597 | 589 | 582 | 574 | 567 |
| 316 | 560 | 552 | 545 | 537 | 530 | 523 | 515 | 508 | 500 | 493 |
| 317 | 486 | 478 | 471 | 464 | 456 | 449 | 441 | 434 | 427 | 420 |
| 318 | 413 | 405 | 398 | 391 | 383 | 376 | 369 | 361 | 354 | 347 |
| 319 | 339 | 332 | 324 | 317 | 310 | 302 | 295 | 288 | 280 | 273 |
| 320 | 266 | 259 | 251 | 244 | 237 | 229 | 222 | 215 | 207 | 200 |
| 321 | 193 | 186 | 178 | 171 | 164 | 156 | 149 | 142 | 134 | 127 |
| 322 | 120 | 113 | 105 | 098 | 091 | 083 | 076 | 069 | 061 | 054 |
| 323 | 047 | 040 | 032 | 025 | 018 | 010 | 003 | *996 | *988 | *981 |
| 324 | 9.65974 | 967 | 959 | 952 | 945 | 937 | 930 | 923 | 915 | 908 |
| 325 | 901 | 894 | 886 | 879 | 872 | 864 | 857 | 850 | 842 | 835 |
| 326 | 828 | 821 | 814 | 806 | 799 | 792 | 785 | 777 | 770 | 763 |
| 327 | 756 | 749 | 741 | 734 | 727 | 720 | 713 | 705 | 698 | 691 |
| 328 | 684 | 677 | 669 | 662 | 655 | 647 | 640 | 633 | 625 | 618 |
| 329 | 611 | 604 | 596 | 589 | 582 | 575 | 568 | 560 | 553 | 546 |
| 330 | 539 | 532 | 524 | 517 | 510 | 503 | 496 | 488 | 481 | 474 |
| 331 | 467 | 460 | 452 | 445 | 438 | 431 | 424 | 417 | 409 | 402 |
| 332 | 395 | 388 | 381 | 374 | 367 | 359 | 352 | 345 | 338 | 331 |
| 333 | 324 | 317 | 309 | 302 | 295 | 288 | 281 | 273 | 266 | 259 |
| 334 | 252 | 245 | 237 | 230 | 223 | 216 | 209 | 201 | 194 | 187 |
| 335 | 180 | 173 | 166 | 159 | 152 | 144 | 137 | 130 | 123 | 116 |
| 336 | 109 | 102 | 094 | 087 | 080 | 073 | 066 | 058 | 051 | 044 |
| 337 | 037 | 030 | 023 | 016 | 009 | 001 | *994 | *987 | *980 | *973 |
| 338 | 9.64966 | 959 | 952 | 945 | 938 | 930 | 923 | 916 | 909 | 902 |
| 339 | 895 | 888 | 881 | 874 | 867 | 859 | 852 | 845 | 838 | 831 |
| 340 | 824 | 817 | 810 | 803 | 796 | 788 | 781 | 774 | 767 | 760 |
| 341 | 753 | 746 | 739 | 732 | 725 | 718 | 710 | 703 | 696 | 689 |
| 342 | 682 | 675 | 668 | 661 | 654 | 647 | 640 | 633 | 626 | 619 |
| 343 | 612 | 605 | 598 | 591 | 584 | 577 | 570 | 563 | 556 | 549 |
| 344 | 542 | 535 | 528 | 521 | 514 | 507 | 500 | 493 | 486 | 479 |
| 345 | 471 | 464 | 457 | 450 | 443 | 436 | 429 | 422 | 415 | 408 |
| 346 | 401 | 394 | 387 | 380 | 373 | 366 | 359 | 352 | 345 | 338 |
| 347 | 331 | 324 | 317 | 310 | 303 | 296 | 289 | 282 | 275 | 268 |
| 348 | 261 | 254 | 247 | 240 | 233 | 225 | 218 | 211 | 204 | 197 |
| 349 | 190 | 183 | 176 | 169 | 162 | 155 | 148 | 141 | 134 | 127 |
| 350 | 120 | 113 | 106 | 099 | 092 | 085 | 078 | 071 | 064 | 057 |

# TABLE

## OF THE ELASTIC FORCE OF THE VAPOR OF WATER FROM —32° TO +230°

REGNAULT. — Mémoires de l'Académie de France, Tome XXI. p. 624.

| Temperature. | Elastic Force. | Difference for 1°. | Temperature. | Elastic Force. | Difference for 1°. | Temperature. | Elastic Force. | Difference for 1°. |
|---|---|---|---|---|---|---|---|---|
| ° | mm. | mm. | ° | mm. | mm. | ° | mm. | mm. |
| —32 | 0.320 | 0.032 | 9 | 8.574 | 0.591 | 50 | 91.982 | 4.679 |
| 31 | 0.352 | 0.034 | 10 | 9.165 | 0.627 | 51 | 96.661 | 4.882 |
| 30 | 0.386 | 0.038 | 11 | 9.792 | 0.665 | 52 | 101.543 | 5.093 |
| 29 | 0.424 | 0.040 | 12 | 10.457 | 0.705 | 53 | 106.636 | 5.309 |
| 28 | 0.464 | 0.044 | 13 | 11.162 | 0.746 | 54 | 111.945 | 5.533 |
| 27 | 0.508 | 0.047 | 14 | 11.908 | 0.791 | 55 | 117.478 | 5.766 |
| 26 | 0.555 | 0.050 | 15 | 12.699 | 0.837 | 56 | 123.244 | 6.007 |
| 25 | 0.605 | 0.055 | 16 | 13.536 | 0.885 | 57 | 129.251 | 6.254 |
| 24 | 0.660 | 0.059 | 17 | 14.421 | 0.936 | 58 | 135.505 | 6.510 |
| 23 | 0.719 | 0.064 | 18 | 15.357 | 0.989 | 59 | 142.015 | 6.776 |
| 22 | 0.783 | 0.070 | 19 | 16.346 | 1.045 | 60 | 148.791 | 7.048 |
| 21 | 0.853 | 0.074 | 20 | 17.391 | 1.104 | 61 | 155.839 | 7.331 |
| 20 | 0.927 | 0.081 | 21 | 18.495 | 1.164 | 62 | 163.170 | 7.621 |
| 19 | 1.008 | 0.087 | 22 | 19.659 | 1.229 | 63 | 170.791 | 7.923 |
| 18 | 1.095 | 0.094 | 23 | 20.888 | 1.296 | 64 | 178.714 | 8.231 |
| 17 | 1.189 | 0.101 | 24 | 22.184 | 1.366 | 65 | 186.945 | 8.551 |
| 16 | 1.290 | 0.110 | 25 | 23.550 | 1.438 | 66 | 195.496 | 8.880 |
| 15 | 1.400 | 0.118 | 26 | 24.988 | 1.517 | 67 | 204.376 | 9.220 |
| 14 | 1.518 | 0.128 | 27 | 26.505 | 1.596 | 68 | 213.596 | 9.569 |
| 13 | 1.646 | 0.137 | 28 | 28.101 | 1.681 | 69 | 223.165 | 9.928 |
| 12 | 1.783 | 0.150 | 29 | 29.782 | 1.766 | 70 | 233.093 | 10.300 |
| 11 | 1.933 | 0.160 | 30 | 31.548 | 1.858 | 71 | 243.393 | 10.680 |
| 10 | 2.093 | 0.174 | 31 | 33.406 | 1.953 | 72 | 254.073 | 11.074 |
| 9 | 2.267 | 0.188 | 32 | 35.359 | 2.052 | 73 | 265.147 | 11.477 |
| 8 | 2.455 | 0.203 | 33 | 37.411 | 2.154 | 74 | 276.624 | 11.893 |
| 7 | 2.658 | 0.218 | 34 | 39.565 | 2.262 | 75 | 288.517 | 12.321 |
| 6 | 2.876 | 0.237 | 35 | 41.827 | 2.374 | 76 | 300.838 | 12.762 |
| 5 | 3.113 | 0.245 | 36 | 44.201 | 2.490 | 77 | 313.600 | 13.211 |
| 4 | 3.368 | 0.276 | 37 | 46.691 | 2.611 | 78 | 326.811 | 13.677 |
| 3 | 3.644 | 0.297 | 38 | 49.302 | 2.737 | 79 | 340.488 | 14.155 |
| 2 | 3.941 | 0.322 | 39 | 52.039 | 2.867 | 80 | 354.643 | 14.644 |
| — 1 | 4.263 | 0.337 | 40 | 54.906 | 3.004 | 81 | 369.287 | 15.148 |
| 0 | 4.600 | 0.340 | 41 | 57.910 | 3.145 | 82 | 384.435 | 15.666 |
| + 1 | 4.940 | 0.362 | 42 | 61.055 | 3.291 | 83 | 400.101 | 16.197 |
| 2 | 5.302 | 0.385 | 43 | 64.346 | 3.444 | 84 | 416.298 | 16.743 |
| 3 | 5.687 | 0.410 | 44 | 67.790 | 3.601 | 85 | 433.041 | 17.303 |
| 4 | 6.097 | 0.437 | 45 | 71.391 | 3.767 | 86 | 450.344 | 17.877 |
| 5 | 6.534 | 0.464 | 46 | 75.158 | 3.935 | 87 | 468.221 | 18.466 |
| 6 | 6.998 | 0.494 | 47 | 79.093 | 4.111 | 88 | 486.687 | 19.072 |
| 7 | 7.492 | 0.525 | 48 | 83.204 | 4.295 | 89 | 505.759 | 19.691 |
| 8 | 8.017 | 0.557 | 49 | 87.499 | 4.483 | 90 | 525.450 | 20.328 |

| Temperature. | Elastic Force. | Difference for 1°. | Temperature. | Elastic Force. | Difference for 1°. | Temperature. | Elastic Force. | Difference for 1°. |
|---|---|---|---|---|---|---|---|---|
| ° | mm. | mm. | ° | mm. | mm. | ° | mm. | mm. |
| 91 | 545.778 | 20.979 | 138 | 2567.000 | 77.440 | 185 | 8453.23 | 191.12 |
| 92 | 566.757 | 21.649 | 139 | 2641.440 | 76.190 | 186 | 8644.35 | 194.47 |
| 93 | 588.406 | 22.334 | 140 | 2717.630 | 77.940 | 187 | 8838.82 | 197.86 |
| 94 | 610.740 | 23.038 | 141 | 2795.570 | 79.730 | 188 | 9036.68 | 201.27 |
| 95 | 633.778 | 23.757 | 142 | 2875.300 | 81.560 | 189 | 9237.95 | 204.75 |
| 96 | 657.535 | 24.494 | 143 | 2956.860 | 83.400 | 190 | 9442.70 | 208.23 |
| 97 | 682.029 | 25.251 | 144 | 3040.260 | 85.290 | 191 | 9650.93 | 211.78 |
| 98 | 707.280 | 26.025 | 145 | 3125.550 | 87.190 | 192 | 9862.71 | 215.33 |
| 99 | 733.305 | 26.695 | 146 | 3212.740 | 89.130 | 193 | 10078.04 | 218.97 |
| 100 | 760.000 | 27.590 | 147 | 3301.870 | 91.110 | 194 | 10297.01 | 222.62 |
| 101 | 787.590 | 28.420 | 148 | 3392.980 | 93.110 | 195 | 10519.63 | 226.32 |
| 102 | 816.010 | 29.270 | 149 | 3486.090 | 95.140 | 196 | 10745.95 | 230.05 |
| 103 | 845.280 | 30.130 | 150 | 3581.230 | 97.200 | 197 | 10975.00 | 233.82 |
| 104 | 875.410 | 31.000 | 151 | 3678.430 | 99.310 | 198 | 11209.82 | 237.64 |
| 105 | 906.410 | 31.900 | 152 | 3777.740 | 101.440 | 199 | 11447.46 | 241.50 |
| 106 | 938.310 | 32.830 | 153 | 3879.180 | 103.590 | 200 | 11688.96 | 245.41 |
| 107 | 971.140 | 33.770 | 154 | 3982.770 | 105.790 | 201 | 11934.37 | 249.32 |
| 108 | 1004.910 | 34.740 | 155 | 4088.560 | 108.030 | 202 | 12183.69 | 253.31 |
| 109 | 1039.650 | 35.720 | 156 | 4196.590 | 110.290 | 203 | 12437.00 | 257.30 |
| 110 | 1075.370 | 36.720 | 157 | 4306.880 | 112.570 | 204 | 12694.30 | 261.36 |
| 111 | 1112.090 | 37.740 | 158 | 4419.450 | 114.910 | 205 | 12955.66 | 265.46 |
| 112 | 1149.830 | 38.780 | 159 | 4534.860 | 117.260 | 206 | 13221.12 | 269.63 |
| 113 | 1188.610 | 39.860 | 160 | 4651.620 | 119 660 | 207 | 13490.75 | 273.78 |
| 114 | 1228.470 | 40.940 | 161 | 4771.280 | 122.080 | 208 | 13764.53 | 277.99 |
| 115 | 1269.410 | 42.060 | 162 | 4893.360 | 124.550 | 209 | 14042.52 | 282.28 |
| 116 | 1311.470 | 43.190 | 163 | 5017.910 | 127.060 | 210 | 14324.80 | 286.52 |
| 117 | 1354.660 | 44.340 | 164 | 5144.970 | 129.570 | 211 | 14611.32 | 290.90 |
| 118 | 1399.020 | 45.530 | 165 | 5274.540 | 132.150 | 212 | 14902.22 | 295.26 |
| 119 | 1444.550 | 46.730 | 166 | 5406.690 | 134.740 | 213 | 15197.48 | 299.69 |
| 120 | 1491.280 | 47.970 | 167 | 5541.430 | 137.390 | 214 | 15497.17 | 304.16 |
| 121 | 1539.250 | 49.220 | 168 | 5678.820 | 140.080 | 215 | 15801.33 | 308.61 |
| 122 | 1588.470 | 50.490 | 169 | 5818.900 | 142.760 | 216 | 16109.94 | 313.21 |
| 123 | 1638.960 | 51.800 | 170 | 5961.660 | 145.530 | 217 | 16423.15 | 317.75 |
| 124 | 1690.760 | 53.120 | 171 | 6107.190 | 148.290 | 218 | 16740.90 | 322.39 |
| 125 | 1743.880 | 54.470 | 172 | 6255.480 | 151.120 | 219 | 17063.29 | 327.07 |
| 126 | 1798.350 | 55.850 | 173 | 6406.600 | 153.950 | 220 | 17390.36 | 331.77 |
| 127 | 1854.200 | 57.270 | 174 | 6560.550 | 156.850 | 221 | 17722.13 | 336.55 |
| 128 | 1911.460 | 58.680 | 175 | 6717.430 | 159.790 | 222 | 18058.64 | 341.30 |
| 129 | 1970.150 | 60.130 | 176 | 6877.220 | 162.750 | 223 | 18399.94 | 346.13 |
| 130 | 2030.280 | 61.660 | 177 | 7039.970 | 165.750 | 224 | 18746.07 | 350.97 |
| 131 | 2091.940 | 63.090 | 178 | 7205.720 | 168.800 | 225 | 19097.04 | 355.88 |
| 132 | 2155.030 | 64.660 | 179 | 7374.520 | 171.870 | 226 | 19452.92 | 360.84 |
| 133 | 2219.690 | 66.230 | 180 | 7546.390 | 174.980 | 227 | 19813.76 | 365.85 |
| 134 | 2285.920 | 67.810 | 181 | 7721.370 | 178.150 | 228 | 20179.61 | 370.87 |
| 135 | 2353.730 | 69.430 | 182 | 7899.520 | 181.320 | 229 | 20550.48 | 375.92 |
| 136 | 2423.160 | 71.070 | 183 | 8080.840 | 184.560 | 230 | 20926.40 | |
| 137 | 2494.230 | 72.770 | 184 | 8265.400 | 187.830 | | | |

# TABLE

## OF THE TENSION OF THE VAPOR OF WATER IN MILLIMETRES FROM 85 TO 101 DEGREES.

REGNAULT. — Mémoires de l'Académie de France, Tome XXI. p. 632.

| Degrees. | Tenths of Degrees. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| ° | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. |
| 85 | 433.04 | 434.75 | 435.46 | 438.17 | 439.89 | 441.62 | 443.35 | 445.09 | 446.84 | 448.59 |
| 86 | 450.34 | 452.10 | 453.87 | 455.64 | 457.42 | 459.21 | 461.00 | 462.80 | 464.60 | 466.41 |
| 87 | 468.22 | 470.04 | 471.87 | 473.70 | 475.54 | 477.38 | 479.23 | 481.08 | 482.94 | 484.81 |
| 88 | 486.69 | 488.57 | 490.45 | 492.34 | 494.24 | 496.15 | 498.06 | 499.98 | 501.90 | 503.82 |
| 89 | 505.76 | 507.70 | 509.65 | 511.60 | 513.56 | 515.53 | 517.50 | 519.48 | 521.46 | 523.45 |
| 90 | 525.45 | 527.45 | 529.46 | 531.48 | 533.50 | 535.53 | 537.57 | 539.61 | 541.66 | 543.72 |
| 91 | 545.78 | 547.85 | 549.92 | 552.00 | 554.09 | 556.19 | 558.29 | 560.39 | 562.51 | 564.63 |
| 92 | 566.76 | 568.89 | 571.03 | 573.18 | 575.34 | 577.50 | 579.67 | 581.84 | 584.02 | 586.20 |
| 93 | 588.41 | 590.61 | 592.82 | 595.04 | 597.26 | 599.49 | 601.72 | 603.97 | 606.22 | 608.48 |
| 94 | 610.74 | 613.01 | 615.29 | 617.58 | 619.85 | 622.17 | 624.48 | 626.79 | 629.11 | 631.44 |
| 95 | 633.78 | 636.12 | 638.47 | 640.83 | 643.19 | 645.57 | 647.95 | 650.34 | 652.73 | 655.13 |
| 96 | 657.54 | 659.95 | 662.37 | 664.80 | 667.24 | 669.69 | 672.14 | 674.60 | 677.07 | 679.55 |
| 97 | 682.03 | 684.52 | 687.02 | 689.53 | 692.04 | 694.56 | 697.08 | 699.61 | 702.15 | 704.70 |
| 98 | 707.26 | 709.82 | 712.39 | 714.97 | 717.56 | 720.15 | 722.75 | 725.35 | 727.96 | 730.58 |
| 99 | 733.21 | 735.85 | 738.50 | 741.16 | 743.83 | 746.50 | 749.18 | 751.87 | 754.57 | 757.28 |
| 100 | 760.00 | 762.73 | 765.46 | 768.20 | 771.95 | 773.71 | 776.48 | 779.26 | 782.04 | 784.83 |
| 101 | 787.63 | | | | | | | | | |

# TABLE

## OF THE TENSION OF THE VAPOR OF WATER IN MILLIMETRES FOR EACH TENTH OF A DEGREE FROM —10° TO +35°.

REGNAULT. — Mémoires de l'Académie de France, Tome XXI. p. 627.

| Degrees. | Tenths of Degrees. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. |
| —10° | 2.078 | | | | | | | | | |
| 9 | 2.261 | 2.242 | 2.223 | 2.204 | 2.186 | 2.168 | 2.150 | 2.132 | 2.114 | 2.096 |
| 8 | 2.456 | 2.436 | 2.416 | 2.396 | 2.376 | 2.356 | 2.337 | 2.318 | 2.299 | 2.280 |
| 7 | 2.666 | 2.645 | 2.624 | 2.603 | 2.582 | 2.561 | 2.540 | 2.519 | 2.498 | 2.477 |
| 6 | 2.890 | 2.867 | 2.844 | 2.821 | 2.798 | 2.776 | 2.754 | 2.732 | 2.710 | 2.688 |
| 5 | 3.131 | 3.106 | 3.082 | 3.058 | 3.034 | 3.010 | 2.986 | 2.962 | 2.938 | 2.914 |
| 4 | 3.387 | 3.361 | 3.335 | 3.309 | 3.283 | 3.257 | 3.231 | 3.206 | 3.181 | 3.156 |
| 3 | 3.662 | 3.634 | 3.606 | 3.578 | 3.550 | 3.522 | 3.495 | 3.468 | 3.441 | 3.414 |
| 2 | 3.955 | 3.925 | 3.895 | 3.865 | 3.836 | 3.807 | 3.778 | 3.749 | 3.720 | 3.691 |
| 1 | 4.267 | 4.235 | 4.203 | 4.171 | 4.140 | 4.109 | 4.078 | 4.047 | 4.016 | 3.985 |
| — 0 | 4.600 | 4.565 | 4.531 | 4.497 | 4.463 | 4.430 | 4.397 | 4.364 | 4.331 | 4.299 |
| + 0 | 4.600 | 4.633 | 4.667 | 4.700 | 4.733 | 4.767 | 4.801 | 4.836 | 4.871 | 4.905 |
| 1 | 4.940 | 4.975 | 5.011 | 5.047 | 5.082 | 5.118 | 5.155 | 5.191 | 5.228 | 5.265 |
| 2 | 5.302 | 5.340 | 5.378 | 5.416 | 5.454 | 5.491 | 5.530 | 5.569 | 5.608 | 5.647 |
| 3 | 5.687 | 5.727 | 5.767 | 5.807 | 5.848 | 5.889 | 5.930 | 5.972 | 6.014 | 6.055 |
| 4 | 6.097 | 6.140 | 6.183 | 6.226 | 6.270 | 6.318 | 6.357 | 6.401 | 6.445 | 6.490 |
| 5 | 6.534 | 6.580 | 6.625 | 6.671 | 6.717 | 6.763 | 6.810 | 6.857 | 6.904 | 6.951 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 6.998 | 7.047 | 7.095 | 7.144 | 7.193 | 7.242 | 7.292 | 7.342 | 7.392 | 7.443 |
| 7 | 7.492 | 7.544 | 7.595 | 7.647 | 7.699 | 7.751 | 7.804 | 7.857 | 7.910 | 7.964 |
| 8 | 8.017 | 8.072 | 8.126 | 8.181 | 8.236 | 8.291 | 8.347 | 8.404 | 8.461 | 8.517 |
| 9 | 8.574 | 8.632 | 8.690 | 8.748 | 8.807 | 8.865 | 8.925 | 8.985 | 9.045 | 9.105 |
| 10 | 9.165 | 9.227 | 9.288 | 9.350 | 9.412 | 9.474 | 9.537 | 9.601 | 9.665 | 9.728 |
| 11 | 9.792 | 9.857 | 9.923 | 9.989 | 10.054 | 10.120 | 10.187 | 10 255 | 10.322 | 10.389 |
| 12 | 10.457 | 10.526 | 10.596 | 10.665 | 10.734 | 10.804 | 10.875 | 10.947 | 11.019 | 11.090 |
| 13 | 11.162 | 11.235 | 11.309 | 11.383 | 11.456 | 11.530 | 11.605 | 11.681 | 11.757 | 11.832 |
| 14 | 11.906 | 11.988 | 12.064 | 12.142 | 12.220 | 12.298 | 12.378 | 12.458 | 12.538 | 12.619 |
| 15 | 12.699 | 12.781 | 12.864 | 12.947 | 13.029 | 13.112 | 13.197 | 13.281 | 13.366 | 13.451 |
| 16 | 13.535 | 13.623 | 13.710 | 13.797 | 13.885 | 13.972 | 14.062 | 14.151 | 14.241 | 14.331 |
| 17 | 14.421 | 14.513 | 14.605 | 14.697 | 14.790 | 14.882 | 14 977 | 15.072 | 15.167 | 15.262 |
| 18 | 15.537 | 15.454 | 15.552 | 15.650 | 15.747 | 15.845 | 15.945 | 16.045 | 16.145 | 16.246 |
| 19 | 16.346 | 16.449 | 16.552 | 16.655 | 16.758 | 16.861 | 16.967 | 17.073 | 17.179 | 17.285 |
| 20 | 17.391 | 17.500 | 17.608 | 17.717 | 17.826 | 17.935 | 18.047 | 18.159 | 18.271 | 18.383 |
| 21 | 18.495 | 18.610 | 18.724 | 18.839 | 18.954 | 19.069 | 19.187 | 19.305 | 19.423 | 19.541 |
| 22 | 19.659 | 19.780 | 19.901 | 20.022 | 20.143 | 20.265 | 20.389 | 20.514 | 20.639 | 20.763 |
| 23 | 20.888 | 21.016 | 21.144 | 21.272 | 21.400 | 21.528 | 21.659 | 21.790 | 21.921 | 22.053 |
| 24 | 22.184 | 22.319 | 22.453 | 22.588 | 22.723 | 22.858 | 22.996 | 23.135 | 23.273 | 23.411 |
| 25 | 23.550 | 23.692 | 23.834 | 23.976 | 24.119 | 24.261 | 24.406 | 24.552 | 24.697 | 24.842 |
| 26 | 24.988 | 25.138 | 25.288 | 25.438 | 25.588 | 25.738 | 25.891 | 26.045 | 26.198 | 26.351 |
| 27 | 26.505 | 26.663 | 26.820 | 26.978 | 27.136 | 27.294 | 27.455 | 27.617 | 27.778 | 27.939 |
| 28 | 28.101 | 28.267 | 28.433 | 28.599 | 28.765 | 28.931 | 29.101 | 29.271 | 29.441 | 29.612 |
| 29 | 29.782 | 29.956 | 30.131 | 30.305 | 30.479 | 30.654 | 30.833 | 31.011 | 31.190 | 31.369 |
| 30 | 31.548 | 31.729 | 31.911 | 32.094 | 32.278 | 32.463 | 32.650 | 32.837 | 33.026 | 33.215 |
| 31 | 33.405 | 33.596 | 33.787 | 33.980 | 34.174 | 34.368 | 34.564 | 34.761 | 34.959 | 35.159 |
| 32 | 35.359 | 35.559 | 35.760 | 35.962 | 36.165 | 36.370 | 36.576 | 36.783 | 36.991 | 37.200 |
| 33 | 37.410 | 37.621 | 37.832 | 38.045 | 38.258 | 38.473 | 38.689 | 38.906 | 39.124 | 39.344 |
| 34 | 39.565 | 39.786 | 40.007 | 40.230 | 40.455 | 40.680 | 40.907 | 41.135 | 41.364 | 41.595 |
| 35 | 41.827 | | | | | | | | | |

# TABLE

## OF THE TENSION OF THE VAPOR OF MERCURY FOR EACH 10 DEGREES.

REGNAULT. — Mémoires de l'Académie de France, Tome XXVI. p. 520.

| Temperature of the Air Thermometer. | Tension. | Temperature of the Air Thermometer. | Tension. | Temperature of the Air Thermometer. | Tension. |
|---|---|---|---|---|---|
| ° | mm. | ° | mm. | ° | mm. |
| 0 | 0.0200 | 180 | 11.00 | 360 | 797.74 |
| 10 | 0.0268 | 190 | 14.84 | 370 | 954.65 |
| 20 | 0.0372 | 200 | 19.90 | 380 | 1139.65 |
| 30 | 0.0530 | 210 | 26.35 | 390 | 1346.71 |
| 40 | 0.0767 | 220 | 34.70 | 400 | 1587.96 |
| 50 | 0.1120 | 230 | 45.35 | 410 | 1863.73 |
| 60 | 0.1643 | 240 | 58.82 | 420 | 2177.53 |
| 70 | 0.2410 | 250 | 75.75 | 430 | 2533.01 |
| 80 | 0.3528 | 260 | 96.73 | 440 | 2933.99 |
| 90 | 0.5142 | 270 | 123.01 | 450 | 3384.35 |
| 100 | 0.7455 | 280 | 155.17 | 460 | 3888.14 |
| 110 | 1.0734 | 290 | 194.46 | 470 | 4449.45 |
| 120 | 1.5341 | 300 | 242.15 | 480 | 5072.43 |
| 130 | 2.1752 | 310 | 299.69 | 490 | 5761.32 |
| 140 | 3.0592 | 320 | 368.73 | 500 | 6520.25 |
| 150 | 4.2664 | 330 | 450.91 | 510 | 7253.44 |
| 160 | 5.9002 | 340 | 548.35 | 520 | 8264.96 |
| 170 | 8.0912 | 350 | 663.18 | | |

# TABLE

FOR DIRECT NITROGEN DETERMINATIONS GIVING $\frac{0.0012562}{(1 + 0.00367\,t)\,760}$.

JAMES T. BROWN. — Jour. Chem. Soc. N. S. Vol. III. p. 210.

| t | $\frac{0.0012562}{(1 + 0.00367\,t)\,760}$ | Diff. | t | $\frac{0.0012562}{(1 + 0.00367\,t)\,760}$ | Diff. |
|---|---|---|---|---|---|
| 0 | 0.00000165289 | | 16 | 0.00000156121 | 544 |
| 1 | 0.00000164685 | 604 | 17 | 0.00000155582 | 539 |
| 2 | 0.00000164085 | 600 | 18 | 0.00000155047 | 535 |
| 3 | 0.00000163489 | 596 | 19 | 0.00000154515 | 532 |
| 4 | 0.00000162898 | 591 | 20 | 0.00000153986 | 529 |
| 5 | 0.00000162311 | 587 | 21 | 0.00000153462 | 524 |
| 6 | 0.00000161728 | 583 | 22 | 0.00000152941 | 521 |
| 7 | 0.00000161149 | 579 | 23 | 0.00000152423 | 518 |
| 8 | 0.00000160574 | 575 | 24 | 0.00000151909 | 514 |
| 9 | 0.00000160004 | 570 | 25 | 0.00000151398 | 511 |
| 10 | 0.00000159438 | 566 | 26 | 0.00000150891 | 507 |
| 11 | 0.00000158875 | 563 | 27 | 0.00000150387 | 504 |
| 12 | 0.00000158317 | 558 | 28 | 0.00000149887 | 500 |
| 13 | 0.00000157762 | 555 | 29 | 0.00000149389 | 498 |
| 14 | 0.00000157211 | 551 | 30 | 0.00000148896 | 493 |
| 15 | 0.00000156665 | 546 | | | |

*Formula for the use of the above table.*

$$W = \frac{0.0012562}{(1 + 0.00367\,t)\,760} \times V \times P.$$

$W$ = weight of gas in grammes.

$t$ = temperature of gas.

$V$ = volume in cc.

$P$ = pressure in mm.

# TABLE

OF $\frac{0.0012932}{760\,(1+0.00367\,t)}$.

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| t | A | Diff. | t | A | Diff. |
|---|---|---|---|---|---|
| ° | | | ° | | |
| —20.0 | 0.00000183636 | 363 | 2.5 | 0.00000171733 | 317 |
| 19.5 | 0.00000183273 | 361 | 2.0 | 0.00000171416 | 317 |
| 19.0 | 0.00000182912 | 360 | 1.5 | 0.00000171099 | 315 |
| 18.5 | 0.00000182552 | 359 | 1.0 | 0.00000170784 | 314 |
| 18.0 | 0.00000182193 | 357 | — 0.5 | 0.00000170470 | 313 |
| 17.5 | 0.00000181836 | 356 | 0.0 | 0.00000170157 | 311 |
| 17.0 | 0.00000181480 | 355 | + 0.5 | 0.00000169846 | 311 |
| 16.5 | 0.00000181125 | 353 | 1.0 | 0.00000169535 | 309 |
| 16.0 | 0.00000180772 | 351 | 1.5 | 0.00000169226 | 308 |
| 15.5 | 0.00000180421 | 351 | 2.0 | 0.00000168918 | 308 |
| 15.0 | 0.00000180070 | 349 | 2.5 | 0.00000168610 | 306 |
| 14.5 | 0.00000179721 | 347 | 3.0 | 0.00000168304 | 305 |
| 14.0 | 0.00000179374 | 347 | 3.5 | 0.00000167999 | 303 |
| 13.5 | 0.00000179027 | 345 | 4.0 | 0.00000167696 | 303 |
| 13.0 | 0.00000178682 | 343 | 4.5 | 0.00000167393 | 302 |
| 12.5 | 0.00000178339 | 343 | 5.0 | 0.00000167091 | 300 |
| 12.0 | 0.00000177996 | 341 | 5.5 | 0.00000166791 | 300 |
| 11.5 | 0.00000177655 | 339 | 6.0 | 0.00000166491 | 298 |
| 11.0 | 0.00000177316 | 339 | 6.5 | 0.00000166193 | 297 |
| 10.5 | 0.00000176977 | 337 | 7.0 | 0.00000165896 | 297 |
| 10.0 | 0.00000176640 | 336 | 7.5 | 0.00000165599 | 295 |
| 9.5 | 0.00000176304 | 334 | 8.0 | 0.00000165304 | 294 |
| 9.0 | 0.00000175970 | 334 | 8.5 | 0.00000165010 | 293 |
| 8.5 | 0.00000175636 | 332 | 9.0 | 0.00000164717 | 292 |
| 8.0 | 0.00000175304 | 330 | 9.5 | 0.00000164425 | 291 |
| 7.5 | 0.00000174974 | 330 | 10.0 | 0.00000164134 | 290 |
| 7.0 | 0.00000174644 | 328 | 10.5 | 0.00000163844 | 289 |
| 6.5 | 0.00000174316 | 327 | 11.0 | 0.00000163555 | 288 |
| 6.0 | 0.00000173989 | 326 | 11.5 | 0.00000163267 | 287 |
| 5.5 | 0.00000173663 | 325 | 12.0 | 0.00000162980 | 286 |
| 5.0 | 0.00000173338 | 323 | 12.5 | 0.00000162694 | 285 |
| 4.5 | 0.00000173015 | 322 | 13.0 | 0.00000162409 | 284 |
| 4.0 | 0.00000172693 | 321 | 13.5 | 0.00000162125 | 283 |
| 3.5 | 0.00000172372 | 320 | 14.0 | 0.00000161842 | 282 |
| 3.0 | 0.00000172052 | 319 | 14.5 | 0.00000161560 | 281 |

| t | A | Diff. | t | A | Diff. |
|---|---|---|---|---|---|
| +15.0° | 0.00000161279 | 280 | +39.0° | 0.00000148852 | 238 |
| 15.5 | 0.00000160999 | 279 | 39.5 | 0.00000148614 | 238 |
| 16.0 | 0.00000160720 | 278 | 40.0 | 0.00000148376 | 237 |
| 16.5 | 0.00000160442 | 277 | 40.5 | 0.00000148139 | 237 |
| 17.0 | 0.00000160165 | 276 | 41.0 | 0.00000147902 | 235 |
| 17.5 | 0.00000159889 | 276 | 41.5 | 0.00000147667 | 235 |
| 18.0 | 0.00000159613 | 274 | 42.0 | 0.00000147432 | 234 |
| 18.5 | 0.00000159339 | 273 | 42.5 | 0.00000147198 | 233 |
| 19.0 | 0.00000159066 | 273 | 43.0 | 0.00000146965 | 233 |
| 19.5 | 0.00000158793 | 271 | 43.5 | 0.00000146732 | 232 |
| 20.0 | 0.00000158522 | 271 | 44.0 | 0.00000146500 | 231 |
| 20.5 | 0.00000158251 | 269 | 44.5 | 0.00000146269 | 230 |
| 21.0 | 0.00000157982 | 269 | 45.0 | 0.00000146039 | 230 |
| 21.5 | 0.00000157713 | 268 | 45.5 | 0.00000145809 | 229 |
| 22.0 | 0.00000157445 | 267 | 46.0 | 0.00000145580 | 228 |
| 22.5 | 0.00000157178 | 266 | 46.5 | 0.00000145352 | 227 |
| 23.0 | 0.00000156912 | 265 | 47.0 | 0.00000145125 | 227 |
| 23.5 | 0.00000156647 | 264 | 47.5 | 0.00000144898 | 226 |
| 24.0 | 0.00000156383 | 263 | 48.0 | 0.00000144672 | 225 |
| 24.5 | 0.00000156120 | 263 | 48.5 | 0.00000144447 | 225 |
| 25.0 | 0.00000155857 | 261 | 49.0 | 0.00000144222 | 224 |
| 25.5 | 0.00000155596 | 261 | 49.5 | 0.00000143998 | 223 |
| 26.0 | 0.00000155335 | 260 | 50.0 | 0.00000143775 | 445 |
| 26.5 | 0.00000155075 | 258 | 51.0 | 0.00000143330 | 442 |
| 27.0 | 0.00000154817 | 258 | 52.0 | 0.00000142888 | 439 |
| 27.5 | 0.00000154559 | 258 | 53.0 | 0.00000142449 | 436 |
| 28.0 | 0.00000154301 | 256 | 54.0 | 0.00000142013 | 434 |
| 28.5 | 0.00000154045 | 255 | 55.0 | 0.00000141579 | 431 |
| 29.0 | 0.00000153790 | 255 | 56.0 | 0.00000141148 | 428 |
| 29.5 | 0.00000153535 | 254 | 57.0 | 0.00000140720 | 426 |
| 30.0 | 0.00000153281 | 253 | 58.0 | 0.00000140294 | 423 |
| 30.5 | 0.00000153028 | 252 | 59.0 | 0.00000139871 | 421 |
| 31.0 | 0.00000152776 | 251 | 60.0 | 0.00000139450 | 418 |
| 31.5 | 0.00000152525 | 251 | 61 0 | 0.00000139032 | 416 |
| 32.0 | 0.00000152274 | 249 | 62.0 | 0.00000138616 | 413 |
| 32.5 | 0.00000152025 | 249 | 63.0 | 0.00000138203 | 410 |
| 33.0 | 0.00000151776 | 248 | 64.0 | 0 00000137793 | 409 |
| 33.5 | 0.00000151528 | 247 | 65.0 | 0.00000137384 | 406 |
| 34.0 | 0.00000151281 | 247 | 66.0 | 0.00000136978 | 403 |
| 34.5 | 0.00000151034 | 245 | 67.0 | 0.00000136575 | 401 |
| 35.0 | 0.00000150789 | 245 | 68.0 | 0.00000136174 | 399 |
| 35.5 | 0.00000150544 | 244 | 69.0 | 0.00000135775 | 396 |
| 36.0 | 0.00000150300 | 243 | 70.0 | 0.00000135379 | 395 |
| 36.5 | 0.00000150057 | 243 | 71.0 | 0.00000134984 | 391 |
| 37.0 | 0.00000149814 | 242 | 72.0 | 0.00000134593 | 390 |
| 37.5 | 0.00000149572 | 240 | 73.0 | 0.00000134203 | 387 |
| 38.0 | 0.00000149332 | 241 | 74.0 | 0.00000133816 | 385 |
| 38.5 | 0.00000149091 | 239 | 75.0 | 0.00000133431 | 383 |

| t | A | Diff. | t | A | Diff. |
|---|---|---|---|---|---|
| +76° | 0.00000133048 | 381 | +124° | 0.00000116940 | 294 |
| 77 | 0.00000132667 | 379 | 125 | 0.00000116646 | 293 |
| 78 | 0.00000132288 | 376 | 126 | 0.00000116353 | 291 |
| 79 | 0.00000131912 | 374 | 127 | 0.00000116062 | 290 |
| 80 | 0.00000131538 | 372 | 128 | 0.00000115772 | 288 |
| 81 | 0.00000131166 | 370 | 129 | 0.00000115484 | 287 |
| 82 | 0.00000130796 | 368 | 130 | 0.00000115197 | 286 |
| 83 | 0.00000130428 | 366 | 131 | 0.00000114911 | 284 |
| 84 | 0.00000130062 | 364 | 132 | 0.00000114627 | 283 |
| 85 | 0.00000129698 | 362 | 133 | 0.00000114344 | 281 |
| 86 | 0.00000129336 | 360 | 134 | 0.00000114063 | 280 |
| 87 | 0.00000128976 | 357 | 135 | 0.00000113783 | 278 |
| 88 | 0.00000128619 | 356 | 136 | 0.00000113505 | 278 |
| 89 | 0.00000128263 | 354 | 137 | 0.00000113227 | 275 |
| 90 | 0.00000127909 | 352 | 138 | 0.00000112952 | 275 |
| 91 | 0.00000127557 | 350 | 139 | 0.00000112677 | 273 |
| 92 | 0.00000127207 | 348 | 140 | 0.00000112404 | 272 |
| 93 | 0.00000126859 | 346 | 141 | 0.00000112132 | 270 |
| 94 | 0.00000126513 | 344 | 142 | 0.00000111862 | 270 |
| 95 | 0.00000126169 | 343 | 143 | 0.00000111592 | 268 |
| 96 | 0.00000125826 | 340 | 144 | 0.00000111324 | 266 |
| 97 | 0.00000125486 | 339 | 145 | 0.00000111058 | 266 |
| 98 | 0.00000125147 | 337 | 146 | 0.00000110792 | 264 |
| 99 | 0.00000124810 | 335 | 147 | 0.00000110528 | 263 |
| 100 | 0.00000124475 | 333 | 148 | 0.00000110265 | 261 |
| 101 | 0.00000124142 | 332 | 149 | 0.00000110004 | 261 |
| 102 | 0.00000123810 | 330 | 150 | 0.00000109743 | 259 |
| 103 | 0.00000123480 | 328 | 151 | 0.00000109484 | 258 |
| 104 | 0.00000123152 | 326 | 152 | 0.00000109226 | 256 |
| 105 | 0.00000122826 | 324 | 153 | 0.00000108970 | 256 |
| 106 | 0.00000122502 | 323 | 154 | 0.00000108714 | 254 |
| 107 | 0.00000122179 | 321 | 155 | 0.00000108460 | 253 |
| 108 | 0.00000121858 | 320 | 156 | 0.00000108207 | 252 |
| 109 | 0.00000121538 | 318 | 157 | 0.00000107955 | 251 |
| 110 | 0.00000121220 | 316 | 158 | 0.00000107704 | 250 |
| 111 | 0.00000120904 | 314 | 159 | 0.00000107454 | 248 |
| 112 | 0.00000120590 | 313 | 160 | 0.00000107206 | 247 |
| 113 | 0.00000120277 | 311 | 161 | 0.00000106959 | 247 |
| 114 | 0.00000119966 | 310 | 162 | 0.00000106712 | 245 |
| 115 | 0.00000119656 | 308 | 163 | 0.00000106467 | 244 |
| 116 | 0.00000119348 | 306 | 164 | 0.00000106223 | 242 |
| 117 | 0.00000119042 | 305 | 165 | 0.00000105981 | 242 |
| 118 | 0.00000118737 | 303 | 166 | 0.00000105739 | 240 |
| 119 | 0.00000118434 | 302 | 167 | 0.00000105499 | 240 |
| 120 | 0.00000118132 | 300 | 168 | 0.00000105259 | 239 |
| 121 | 0.00000117832 | 299 | 169 | 0.00000105020 | 237 |
| 122 | 0.00000117533 | 297 | 170 | 0.00000104783 | 236 |
| 123 | 0.00000117236 | 296 | 171 | 0.00000104547 | 236 |

| t | A | Dif. | t | A | Dif. |
|---|---|---|---|---|---|
| +172° | 0.00000104311 | 234 | +220° | 0.00000094145 | 191 |
| 173 | 0.00000104077 | 233 | 221 | 0.00000093954 | 190 |
| 174 | 0.00000103844 | 232 | 222 | 0.00000093764 | 190 |
| 175 | 0.00000103612 | 231 | 223 | 0.00000093574 | 188 |
| 176 | 0.00000103381 | 230 | 224 | 0.00000093386 | 188 |
| 177 | 0.00000103151 | 229 | 225 | 0.00000093198 | 187 |
| 178 | 0.00000102922 | 228 | 226 | 0.00000093011 | 186 |
| 179 | 0.00000102694 | 227 | 227 | 0.00000092825 | 185 |
| 180 | 0.00000102467 | 226 | 228 | 0.00000092640 | 185 |
| 181 | 0.00000102241 | 225 | 229 | 0.00000092455 | 184 |
| 182 | 0.00000102016 | 224 | 230 | 0.00000092271 | 183 |
| 183 | 0.00000101792 | 223 | 231 | 0.00000092088 | 183 |
| 184 | 0.00000101569 | 222 | 232 | 0.00000091905 | 182 |
| 185 | 0.00000101347 | 221 | 233 | 0.00000091723 | 181 |
| 186 | 0.00000101126 | 220 | 234 | 0.00000091542 | 180 |
| 187 | 0.00000100906 | 219 | 235 | 0.00000091362 | 180 |
| 188 | 0.00000100687 | 218 | 236 | 0.00000091182 | 179 |
| 189 | 0.00000100469 | 217 | 237 | 0.00000091003 | 178 |
| 190 | 0.00000100252 | 217 | 238 | 0.00000090825 | 178 |
| 191 | 0.00000100035 | 215 | 239 | 0.00000090647 | 177 |
| 192 | 0.00000099820 | 215 | 240 | 0.00000090470 | 176 |
| 193 | 0.00000099605 | 213 | 241 | 0.00000090294 | 175 |
| 194 | 0.00000099392 | 213 | 242 | 0.00000090119 | 175 |
| 195 | 0.00000099179 | 211 | 243 | 0.00000089944 | 174 |
| 196 | 0.00000098968 | 211 | 244 | 0.00000089770 | 174 |
| 197 | 0.00000098757 | 210 | 245 | 0.00000089596 | 173 |
| 198 | 0.00000098547 | 209 | 246 | 0.00000089423 | 172 |
| 199 | 0.00000098338 | 208 | 247 | 0.00000089251 | 171 |
| 200 | 0.00000098130 | 207 | 248 | 0.00000089080 | 171 |
| 201 | 0.00000097923 | 207 | 249 | 0.00000088909 | 170 |
| 202 | 0.00000097716 | 205 | 250 | 0.00000088739 | 170 |
| 203 | 0.00000097511 | 205 | 251 | 0.00000088569 | 169 |
| 204 | 0.00000097306 | 204 | 252 | 0.00000088400 | 168 |
| 205 | 0.00000097102 | 203 | 253 | 0.00000088232 | 167 |
| 206 | 0.00000096899 | 202 | 254 | 0.00000088065 | 167 |
| 207 | 0.00000096697 | 201 | 255 | 0.00000087898 | 167 |
| 208 | 0.00000096496 | 201 | 256 | 0.00000087731 | 165 |
| 209 | 0.00000096295 | 199 | 257 | 0.00000087566 | 165 |
| 210 | 0.00000096096 | 199 | 258 | 0.00000087401 | 165 |
| 211 | 0.00000095897 | 198 | 259 | 0.00000087236 | 164 |
| 212 | 0.00000095699 | 197 | 260 | 0.00000087072 | 163 |
| 213 | 0.00000095502 | 196 | 261 | 0.00000086909 | 162 |
| 214 | 0.00000095306 | 196 | 262 | 0.00000086747 | 162 |
| 215 | 0.00000095110 | 194 | 263 | 0.00000086585 | 162 |
| 216 | 0.00000094916 | 194 | 264 | 0.00000086423 | 161 |
| 217 | 0.00000094722 | 193 | 265 | 0.00000086262 | 160 |
| 218 | 0.00000094529 | 193 | 266 | 0.00000086102 | 159 |
| 219 | 0.00000094336 | 191 | 267 | 0.00000085943 | 159 |

| t | A | Diff. | t | A | Diff. |
|---|---|---|---|---|---|
| ° | | | ° | | |
| +268 | 0.00000085784 | 159 | +310 | 0.00000079598 | 136 |
| 269 | 0.00000085625 | 158 | 311 | 0.00000079462 | 136 |
| 270 | 0.00000085467 | 157 | 312 | 0.00000079326 | 136 |
| 271 | 0.00000085310 | 157 | 313 | 0.00000079190 | 135 |
| 272 | 0.00000085153 | 156 | 314 | 0.00000079055 | 134 |
| 273 | 0.00000084997 | 155 | 315 | 0.00000078921 | 134 |
| 274 | 0.00000084842 | 155 | 316 | 0.00000078787 | 134 |
| 275 | 0.00000084687 | 155 | 317 | 0.00000078653 | 133 |
| 276 | 0.00000084532 | 153 | 318 | 0.00000078520 | 133 |
| 277 | 0.00000084379 | 154 | 319 | 0.00000078387 | 132 |
| 278 | 0.00000084225 | 152 | 320 | 0.00000078255 | 132 |
| 279 | 0.00000084073 | 153 | 321 | 0.00000078123 | 132 |
| 280 | 0.00000083920 | 151 | 322 | 0.00000077991 | 131 |
| 281 | 0.00000083769 | 151 | 323 | 0.00000077860 | 130 |
| 282 | 0.00000083618 | 151 | 324 | 0.00000077730 | 130 |
| 283 | 0.00000083467 | 150 | 325 | 0.00000077600 | 130 |
| 284 | 0.00000083317 | 149 | 326 | 0.00000077470 | 129 |
| 285 | 0.00000083168 | 149 | 327 | 0.00000077341 | 129 |
| 286 | 0.00000083019 | 149 | 328 | 0.00000077212 | 128 |
| 287 | 0.00000082870 | 148 | 329 | 0.00000077084 | 128 |
| 288 | 0.00000082722 | 147 | 330 | 0.00000076956 | 128 |
| 289 | 0.00000082575 | 147 | 331 | 0.00000076828 | 127 |
| 290 | 0.00000082428 | 146 | 332 | 0.00000076701 | 127 |
| 291 | 0.00000082282 | 146 | 333 | 0.00000076574 | 126 |
| 292 | 0.00000082136 | 145 | 334 | 0.00000076448 | 126 |
| 293 | 0.00000081991 | 145 | 335 | 0.00000076322 | 125 |
| 294 | 0.00000081846 | 144 | 336 | 0.00000076197 | 125 |
| 295 | 0.00000081702 | 144 | 337 | 0.00000076072 | 125 |
| 296 | 0.00000081558 | 143 | 338 | 0.00000075947 | 124 |
| 297 | 0.00000081415 | 143 | 339 | 0.00000075823 | 124 |
| 298 | 0.00000081272 | 142 | 340 | 0.00000075699 | 123 |
| 299 | 0.00000081130 | 141 | 341 | 0.00000075576 | 123 |
| 300 | 0.00000080989 | 142 | 342 | 0.00000075453 | 123 |
| 301 | 0.00000080847 | 140 | 343 | 0.00000075330 | 122 |
| 302 | 0.00000080707 | 141 | 344 | 0.00000075208 | 122 |
| 303 | 0.00000080566 | 139 | 345 | 0.00000075086 | 121 |
| 304 | 0.00000080427 | 140 | 346 | 0.00000074965 | 121 |
| 305 | 0.00000080287 | 138 | 347 | 0.00000074844 | 121 |
| 306 | 0.00000080149 | 139 | 348 | 0.00000074723 | 120 |
| 307 | 0.00000080010 | 138 | 349 | 0.00000074603 | 120 |
| 308 | 0.00000079872 | 137 | 350 | 0.00000074483 | |
| 309 | 0.00000079735 | 137 | | | |

# TABLE

OF $\frac{0.00367}{1+0.00367\,t}$.

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| t | $\frac{0.00367}{1+0.00367\,t}$ | Diff. | t | $\frac{0.00367}{1+0.00367\,t}$ | Diff. |
|---|---|---|---|---|---|
| ° | | | ° | | |
| —20.0 | 0.00396071 | 783 | — 2.5 | 0.00370398 | 685 |
| 19.5 | 0.00395288 | 779 | 2.0 | 0.00369713 | 682 |
| 19.0 | 0.00394509 | 777 | 1.5 | 0.00369031 | 680 |
| 18.5 | 0.00393732 | 774 | 1.0 | 0.00368351 | 677 |
| 18.0 | 0.00392958 | 770 | — 0.5 | 0.00367674 | 674 |
| 17.5 | 0.00392188 | 768 | 0.0 | 0.00367000 | 673 |
| 17.0 | 0.00391420 | 764 | + 0.5 | 0.00366327 | 669 |
| 16.5 | 0.00390656 | 762 | 1.0 | 0.00365658 | 668 |
| 16.0 | 0.00389894 | 758 | 1.5 | 0.00364990 | 665 |
| 15.5 | 0.00389136 | 756 | 2.0 | 0.00364325 | 662 |
| 15.0 | 0.00388380 | 753 | 2.5 | 0.00363663 | 660 |
| 14.5 | 0.00387627 | 750 | 3.0 | 0.00363003 | 658 |
| 14.0 | 0.00386877 | 747 | 3.5 | 0.00362345 | 655 |
| 13.5 | 0.00386130 | 744 | 4.0 | 0.00361690 | 653 |
| 13.0 | 0.00385386 | 741 | 4.5 | 0.00361037 | 651 |
| 12.5 | 0.00384645 | 738 | 5.0 | 0.00360386 | 648 |
| 12.0 | 0.00383907 | 736 | 5.5 | 0.00359738 | 646 |
| 11.5 | 0.00383171 | 732 | 6.0 | 0.00359092 | 643 |
| 11.0 | 0.00382439 | 730 | 6.5 | 0.00358449 | 642 |
| 10.5 | 0.00381709 | 727 | 7.0 | 0.00357807 | 639 |
| 10.0 | 0.00380982 | 725 | 7.5 | 0.00357168 | 636 |
| 9.5 | 0.00380257 | 721 | 8.0 | 0.00356532 | 635 |
| 9.0 | 0.00379536 | 719 | 8.5 | 0.00355897 | 632 |
| 8.5 | 0.00378817 | 716 | 9.0 | 0.00355265 | 630 |
| 8.0 | 0.00378101 | 714 | 9.5 | 0.00354635 | 628 |
| 7.5 | 0.00377387 | 711 | 10.0 | 0.00354007 | 625 |
| 7.0 | 0.00376676 | 708 | 10.5 | 0.00353382 | 623 |
| 6.5 | 0.00375968 | 705 | 11.0 | 0.00352759 | 621 |
| 6.0 | 0.00375263 | 703 | 11.5 | 0.00352138 | 619 |
| 5.5 | 0.00374560 | 700 | 12.0 | 0.00351519 | 617 |
| 5.0 | 0.00373860 | 698 | 12.5 | 0.00350902 | 615 |
| 4.5 | 0.00373162 | 695 | 13.0 | 0.00350287 | 612 |
| 4.0 | 0.00372467 | 692 | 13.5 | 0.00349675 | 610 |
| 3.5 | 0.00371775 | 690 | 14.0 | 0.00349065 | 609 |
| 3.0 | 0.00371085 | 687 | 14.5 | 0.00348456 | 606 |

| t | $\frac{0.00367}{1+0.00367t}$ | Diff. | t | $\frac{0.00367}{1+0.00367t}$ | Diff. |
|---|---|---|---|---|---|
| +15.0° | 0.00347850 | 604 | +33.0° | 0.00327354 | 535 |
| 15.5 | 0.00347246 | 601 | 33.5 | 0.00326819 | 533 |
| 16.0 | 0.00346645 | 600 | 34.0 | 0.00326286 | 532 |
| 16.5 | 0.00346045 | 598 | 34.5 | 0.00325754 | 530 |
| 17.0 | 0.00345447 | 596 | 35.0 | 0.00325224 | 528 |
| 17.5 | 0.00344851 | 593 | 35.5 | 0.00324696 | 526 |
| 18.0 | 0.00344258 | 592 | 36.0 | 0.00324170 | 524 |
| 18.5 | 0.00343666 | 589 | 36.5 | 0.00323646 | 523 |
| 19.0 | 0.00343077 | 588 | 37.0 | 0.00323123 | 522 |
| 19.5 | 0.00342489 | 585 | 37.5 | 0.00322601 | 519 |
| 20.0 | 0.00341904 | 584 | 38.0 | 0.00322082 | 518 |
| 20.5 | 0.00341320 | 581 | 38.5 | 0.00321564 | 516 |
| 21.0 | 0.00340739 | 580 | 39.0 | 0.00321048 | 515 |
| 21.5 | 0.00340159 | 577 | 39.5 | 0.00320533 | 513 |
| 22.0 | 0.00339582 | 577 | 40.0 | 0.00320020 | 511 |
| 22.5 | 0.00339005 | 573 | 40.5 | 0.00319509 | 509 |
| 23.0 | 0.00338432 | 571 | 41.0 | 0.00319000 | 508 |
| 23.5 | 0.00337861 | 570 | 41.5 | 0.00318492 | 507 |
| 24.0 | 0.00337291 | 568 | 42.0 | 0.00317985 | 505 |
| 24.5 | 0.00336723 | 566 | 42.5 | 0.00317480 | 503 |
| 25.0 | 0.00336157 | 564 | 43.0 | 0.00316977 | 501 |
| 25.5 | 0.00335593 | 562 | 43.5 | 0.00316476 | 500 |
| 26.0 | 0.00335031 | 560 | 44.0 | 0.00315976 | 499 |
| 26.5 | 0.00334471 | 559 | 44.5 | 0.00315477 | 497 |
| 27.0 | 0.00333912 | 556 | 45.0 | 0.00314980 | 495 |
| 27.5 | 0.00333356 | 555 | 45.5 | 0.00314485 | 494 |
| 28.0 | 0.00332801 | 553 | 46.0 | 0.00313991 | 492 |
| 28.5 | 0.00332248 | 551 | 46.5 | 0.00313499 | 490 |
| 29.0 | 0.00331697 | 549 | 47.0 | 0.00313009 | 490 |
| 29.5 | 0.00331148 | 548 | 47.5 | 0.00312519 | 487 |
| 30.0 | 0.00330600 | 545 | 48.0 | 0.00312032 | 486 |
| 30.5 | 0.00330055 | 544 | 48.5 | 0.00311546 | 485 |
| 31.0 | 0.00329511 | 542 | 49.0 | 0.00311061 | 483 |
| 31.5 | 0.00328969 | 540 | 49.5 | 0.00310578 | 481 |
| 32.0 | 0.00328429 | 539 | 50.0 | 0.00310097 | |
| 32.5 | 0.00327890 | 536 | | | |

## EXAMPLE

OF THE USE OF THE TABLES FOR REDUCTION OF A BAROMETER TO 0°.

| | | mm. |
|---|---|---|
| Observed height Barometer with glass scale | | 740.0 |
| Attached Thermometer | | 14.5 |

| | | ° | mm. |
|---|---|---|---|
| Correction for | | 10 | 1.266140 |
| " | " | 4 | 0.506460 |
| " | " | 0.5 | 0.063307 |
| | | Total, | 1.835907 |

. rue height of Barometer 740 — 1.84 = 738.16.

If the temperature is below 0° C. the correction becomes Additive.

The table for a brass scale is used in the same manner.

# TABLE

## FOR THE REDUCTION OF A BAROMETER WITH A GLASS SCALE TO 0° C.

BUNSEN. — Gasometrischen Tafeln, p. 14.

| Millimetres. | Degrees. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. |
| 5 | 0.00085 | 0.00171 | 0.00256 | 0.00342 | 0.00428 | 0.00513 | 0.00599 | 0.00684 | 0.00770 | 0.00855 |
| 10 | 0.00171 | 0.00342 | 0.00513 | 0.00684 | 0.00856 | 0.01027 | 0.01198 | 0.01369 | 0.01540 | 0.01711 |
| 15 | 0.00256 | 0.00513 | 0.00769 | 0.01026 | 0.01284 | 0.01540 | 0.01797 | 0.02053 | 0.02310 | 0.02566 |
| 20 | 0.00342 | 0.00684 | 0.01027 | 0.01368 | 0.01712 | 0.02054 | 0.02396 | 0.02738 | 0.03080 | 0.03422 |
| 25 | 0 00427 | 0.00855 | 0.01283 | 0.01710 | 0.02139 | 0.02567 | 0.02995 | 0.03422 | 0.03850 | 0.04277 |
| 30 | 0.00513 | 0.01026 | 0.01540 | 0.02052 | 0.02567 | 0.03080 | 0.03593 | 0.04107 | 0.04620 | 0.05133 |
| 35 | 0.00598 | 0.01197 | 0.01797 | 0.02394 | 0.02995 | 0.03594 | 0.04192 | 0.04791 | 0.05390 | 0.05988 |
| 40 | 0.00684 | 0.01368 | 0.02053 | 0.02736 | 0.03423 | 0.04107 | 0.04791 | 0.05476 | 0.06160 | 0.06844 |
| 45 | 0.00769 | 0.01539 | 0.02310 | 0.03078 | 0.03850 | 0.04620 | 0.05390 | 0.06160 | 0.06930 | 0.07699 |
| 50 | 0.00855 | 0.01711 | 0.02567 | 0.03422 | 0.04278 | 0.05133 | 0.05989 | 0.06844 | 0.07700 | 0.08555 |
| 55 | 0.00940 | 0.01882 | 0.02824 | 0.03764 | 0.04706 | 0.05646 | 0.06588 | 0.07528 | 0.08470 | 0.09410 |
| 60 | 0.01026 | 0.02053 | 0.03080 | 0.04106 | 0.05134 | 0.06160 | 0.07187 | 0.08213 | 0.09240 | 0.10266 |
| 65 | 0.01111 | 0.02224 | 0.03337 | 0.04449 | 0.05562 | 0.06673 | 0.07786 | 0.08897 | 0.10010 | 0.11121 |
| 70 | 0.01197 | 0.02395 | 0.03593 | 0.04791 | 0.05990 | 0.07187 | 0.08385 | 0.09582 | 0.10780 | 0.11977 |
| 75 | 0.01282 | 0.02567 | 0.03850 | 0.05153 | 0.06417 | 0.07700 | 0.08983 | 0.10266 | 0.11550 | 0.12832 |
| 80 | 0.01368 | 0.02738 | 0.04106 | 0.05476 | 0.06845 | 0.08213 | 0.09582 | 0.10951 | 0.12320 | 0.13688 |
| 85 | 0.01453 | 0.02909 | 0.04363 | 0.05818 | 0.07273 | 0.08727 | 0.10181 | 0.11635 | 0.13090 | 0.14543 |
| 90 | 0.01539 | 0.03080 | 0.04619 | 0.06160 | 0.07701 | 0.09240 | 0.10780 | 0.12320 | 0.13860 | 0.15399 |
| 95 | 0.01625 | 0.03251 | 0.04876 | 0.06502 | 0.08129 | 0.09753 | 0.11378 | 0.13004 | 0.14630 | 0.16254 |
| 100 | 0.01711 | 0.03422 | 0.05133 | 0.06844 | 0.08555 | 0.10266 | 0.11977 | 0.13688 | 0.15899 | 0.17110 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 105 | 0.01796 | 0.03593 | 0.05390 | 0.07186 | 0.08983 | 0.10779 | 0.12576 | 0.14372 | 0.16169 | 0.17965 |
| 110 | 0.01882 | 0.03764 | 0.05646 | 0.07528 | 0.09411 | 0.11293 | 0.13175 | 0.15057 | 0.16939 | 0.18821 |
| 115 | 0.01967 | 0.03935 | 0.05903 | 0.07871 | 0.09839 | 0.11806 | 0.13774 | 0.15741 | 0.17709 | 0.19676 |
| 120 | 0.02053 | 0.04106 | 0.06160 | 0.08213 | 0.10266 | 0.12320 | 0.14372 | 0.16426 | 0.18479 | 0.20532 |
| 125 | 0.02138 | 0.04278 | 0.06416 | 0.08555 | 0.10694 | 0.12833 | 0.14971 | 0.17110 | 0.19248 | 0.21387 |
| 130 | 0.02224 | 0.04449 | 0.06673 | 0.08898 | 0.11122 | 0.13346 | 0.15570 | 0.17795 | 0.20018 | 0.22243 |
| 135 | 0.02309 | 0.04620 | 0.06929 | 0.09240 | 0.11549 | 0.13860 | 0.16169 | 0.18479 | 0.20788 | 0.23098 |
| 140 | 0.02395 | 0.04791 | 0.07186 | 0.09582 | 0.11977 | 0.14374 | 0.16767 | 0.19164 | 0.21558 | 0.23954 |
| 145 | 0.02480 | 0.04962 | 0.07442 | 0.09924 | 0.12405 | 0.14887 | 0.17366 | 0.19848 | 0.22328 | 0.24809 |
| 150 | 0.02566 | 0.05133 | 0.07699 | 0.10266 | 0.12832 | 0.15399 | 0.17965 | 0.20532 | 0.23098 | 0.25665 |
| 155 | 0.02651 | 0.05304 | 0.07956 | 0.10608 | 0.13260 | 0.15912 | 0.18564 | 0.21216 | 0.23868 | 0.26520 |
| 160 | 0.02737 | 0.05475 | 0.08212 | 0.10950 | 0.13688 | 0.16426 | 0.19163 | 0.21901 | 0.24638 | 0.27376 |
| 165 | 0.02822 | 0.05646 | 0.08469 | 0.11293 | 0.14116 | 0.16939 | 0.19762 | 0.22585 | 0.25408 | 0.28231 |
| 170 | 0.02908 | 0.05817 | 0.08726 | 0.11635 | 0.14543 | 0.17453 | 0.20361 | 0.23270 | 0.26178 | 0.29087 |
| 175 | 0.02994 | 0.05989 | 0.08982 | 0.11977 | 0.14971 | 0.17966 | 0.20959 | 0.23954 | 0.26948 | 0.29942 |
| 180 | 0.03079 | 0.06160 | 0.09239 | 0.12320 | 0.15399 | 0.18479 | 0.21553 | 0.24639 | 0.27718 | 0.30798 |
| 185 | 0.03165 | 0.06331 | 0.09495 | 0.12662 | 0.15827 | 0.18993 | 0.22157 | 0.25323 | 0.28488 | 0.31653 |
| 190 | 0.03250 | 0.06502 | 0.09752 | 0.13004 | 0.16254 | 0.19506 | 0.22756 | 0.26008 | 0.29258 | 0.32509 |
| 195 | 0.03336 | 0.06673 | 0.10008 | 0.13346 | 0.16682 | 0.20019 | 0.23355 | 0.26692 | 0.30028 | 0.33364 |
| 200 | 0.03422 | 0.06844 | 0.10266 | 0.13688 | 0.17110 | 0.20532 | 0.23954 | 0.27376 | 0.30798 | 0.34220 |
| 205 | 0.03507 | 0.07015 | 0.10523 | 0.14030 | 0.17538 | 0.21045 | 0.24553 | 0.28060 | 0.31568 | 0.35075 |
| 210 | 0.03593 | 0.07186 | 0.10779 | 0.14372 | 0.17966 | 0.21559 | 0.25152 | 0.28745 | 0.32338 | 0.35931 |
| 215 | 0.03678 | 0.07357 | 0.11036 | 0.14715 | 0.18394 | 0.22072 | 0.25751 | 0.29429 | 0.33108 | 0.36786 |
| 220 | 0.03764 | 0.07528 | 0.11293 | 0.15057 | 0.18821 | 0.22586 | 0.26349 | 0.30114 | 0.33878 | 0.37642 |
| 225 | 0.03849 | 0.07700 | 0.11549 | 0.15399 | 0.19249 | 0.23099 | 0.26948 | 0.30798 | 0.34647 | 0.38497 |
| 230 | 0.03935 | 0.07871 | 0.11805 | 0.15742 | 0.19677 | 0.23612 | 0.27547 | 0.31483 | 0.35417 | 0.39353 |
| 235 | 0.04020 | 0.08042 | 0.12062 | 0.16084 | 0.20105 | 0.24126 | 0.28145 | 0.32167 | 0.36187 | 0.40208 |
| 240 | 0.04106 | 0.08213 | 0.12318 | 0.16426 | 0.20532 | 0.24639 | 0.28744 | 0.32852 | 0.36957 | 0.41064 |
| 245 | 0.04191 | 0.08384 | 0.12575 | 0.16768 | 0.20960 | 0.25152 | 0.29343 | 0.33536 | 0.37727 | 0.41919 |
| 250 | 0.04277 | 0.08555 | 0.12832 | 0.17110 | 0.21387 | 0.25665 | 0.29942 | 0.34220 | 0.38497 | 0.42775 |

| Millimetres. | Degrees. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. |
| 255 | 0.04362 | 0.08726 | 0.13089 | 0.17452 | 0.21815 | 0.26178 | 0.30541 | 0.34904 | 0.39267 | 0.43630 |
| 260 | 0.04448 | 0.08897 | 0.13345 | 0.17794 | 0.22243 | 0.26692 | 0.31140 | 0.35589 | 0.40037 | 0.44486 |
| 265 | 0 04534 | 0.09068 | 0.13601 | 0.18137 | 0.22671 | 0.27205 | 0.31739 | 0.36273 | 0.40807 | 0.45341 |
| 270 | 0.04619 | 0.09239 | 0.13858 | 0.18479 | 0.23098 | 0.27719 | 0.32338 | 0.36958 | 0.41577 | 0.46197 |
| 275 | 0.04705 | 0.09411 | 0.14115 | 0.18821 | 0.23526 | 0.28232 | 0.32936 | 0.37642 | 0.42347 | 0.47052 |
| 280 | 0.04790 | 0.09582 | 0.14371 | 0.19164 | 0.23954 | 0.28745 | 0.33535 | 0.38327 | 0.43117 | 0.47908 |
| 285 | 0.04876 | 0.09753 | 0.14628 | 0.19506 | 0.24381 | 0.29259 | 0.34134 | 0.39011 | 0.43887 | 0.48763 |
| 290 | 0.04961 | 0.09924 | 0.14884 | 0.19848 | 0.24809 | 0.29772 | 0.34733 | 0.39696 | 0.44657 | 0.49619 |
| 295 | 0.05047 | 0.10095 | 0.15141 | 0.20190 | 0.25237 | 0.30285 | 0.35332 | 0.40380 | 0.45427 | 0.50474 |
| 300 | 0.05133 | 0.10266 | 0.15399 | 0.20532 | 0.25665 | 0.30798 | 0.35931 | 0.41064 | 0.46197 | 0.51330 |
| 305 | 0.05218 | 0.10437 | 0.15656 | 0.20874 | 0.26093 | 0.31311 | 0.36530 | 0.41748 | 0.46967 | 0.52185 |
| 310 | 0.05304 | 0.10608 | 0.15912 | 0.21216 | 0.26521 | 0.31825 | 0.37129 | 0.42433 | 0.47737 | 0.53041 |
| 315 | 0.05389 | 0.10779 | 0.16169 | 0.21559 | 0.26949 | 0.32338 | 0.37728 | 0.43117 | 0.48507 | 0.53896 |
| 320 | 0.05475 | 0.10951 | 0.16426 | 0.21901 | 0.27376 | 0.32852 | 0.38326 | 0.43802 | 0.49277 | 0.54752 |
| 325 | 0.05560 | 0.11122 | 0.16682 | 0.22243 | 0.27804 | 0.33365 | 0.38925 | 0.44486 | 0.50046 | 0.55607 |
| 330 | 0.05646 | 0.11293 | 0.16939 | 0.22586 | 0.28232 | 0.33878 | 0.39524 | 0.45171 | 0.50816 | 0.56463 |
| 335 | 0.05731 | 0.11464 | 0.17195 | 0.22928 | 0.28659 | 0.34392 | 0.40122 | 0.45855 | 0.51586 | 0.57318 |
| 340 | 0.05817 | 0.11635 | 0.17452 | 0.23270 | 0.29087 | 0.34905 | 0.40721 | 0.46540 | 0.52356 | 0.58174 |
| 345 | 0.05902 | 0.11806 | 0.17708 | 0.23612 | 0.29515 | 0.35418 | 0.41320 | 0.47224 | 0.53126 | 0.59029 |
| 350 | 0.05988 | 0.11977 | 0.17965 | 0.23954 | 0.29942 | 0.35931 | 0.41919 | 0.47908 | 0.53896 | 0.59885 |
| 355 | 0.06074 | 0.12148 | 0.18222 | 0.24296 | 0.30370 | 0.36444 | 0.42518 | 0.48592 | 0.54666 | 0.60740 |
| 360 | 0.06159 | 0.12319 | 0.18478 | 0.24638 | 0.30798 | 0.36958 | 0.43117 | 0.49277 | 0.55436 | 0.61596 |
| 365 | 0.06245 | 0.12490 | 0.18735 | 0.24981 | 0.31226 | 0.37471 | 0.43716 | 0.49961 | 0.56206 | 0.62451 |
| 370 | 0.06330 | 0.12662 | 0.18992 | 0.25323 | 0.31653 | 0.37985 | 0.44315 | 0.50646 | 0.56976 | 0.63307 |
| 375 | 0.06416 | 0.12833 | 0.19248 | 0.25665 | 0.32081 | 0.38498 | 0.44913 | 0.51330 | 0.57746 | 0.64162 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 380 | 0.06501 | 0.13004 | 0.19505 | 0.26008 | 0.32509 | 0.39011 | 0.45512 | 0.52015 | 0.58516 | 0.65018 |
| 385 | 0.06587 | 0.13175 | 0.19761 | 0.26350 | 0.32937 | 0.39525 | 0.46111 | 0.52699 | 0.59286 | 0.65873 |
| 390 | 0.06672 | 0.13346 | 0.20018 | 0.26692 | 0.33364 | 0.40038 | 0.46710 | 0.53384 | 0.60056 | 0.66729 |
| 395 | 0.06758 | 0.13517 | 0.20274 | 0.27034 | 0.33792 | 0.40552 | 0.47309 | 0.54068 | 0.60826 | 0.67584 |
| 400 | 0.06844 | 0.13688 | 0.20532 | 0.27376 | 0.34220 | 0.41064 | 0.47908 | 0.54752 | 0.61596 | 0.68440 |
| 405 | 0.06929 | 0.13859 | 0.20789 | 0.27718 | 0.34648 | 0.41577 | 0.48507 | 0.55436 | 0.62366 | 0.69295 |
| 410 | 0.07015 | 0.14030 | 0.21045 | 0.28060 | 0.35076 | 0.42091 | 0.49106 | 0.56121 | 0.63136 | 0.70151 |
| 415 | 0.07100 | 0.14201 | 0.21302 | 0.28403 | 0.35504 | 0.42604 | 0.49705 | 0.56805 | 0.63906 | 0.71006 |
| 420 | 0.07186 | 0.14373 | 0.21559 | 0.28745 | 0.35931 | 0.43118 | 0.50303 | 0.57490 | 0.64676 | 0.71862 |
| 425 | 0.07271 | 0.14544 | 0.21815 | 0.29087 | 0.36359 | 0.43631 | 0.50902 | 0.58174 | 0.65445 | 0.72717 |
| 430 | 0.07357 | 0.14715 | 0.22072 | 0.29430 | 0.36787 | 0.44144 | 0.51501 | 0.58859 | 0.66215 | 0.73573 |
| 435 | 0.07442 | 0.14886 | 0.22328 | 0.29772 | 0.37215 | 0.44658 | 0.52099 | 0.59543 | 0.66985 | 0.74428 |
| 440 | 0.07528 | 0.15057 | 0.22585 | 0.30114 | 0.37642 | 0.45171 | 0.52698 | 0.60228 | 0.67755 | 0.75284 |
| 445 | 0.07613 | 0.15228 | 0.22841 | 0.30456 | 0.38070 | 0.45684 | 0.53297 | 0.60912 | 0.68525 | 0.76139 |
| 450 | 0.07699 | 0.15399 | 0.23098 | 0.30798 | 0.38497 | 0.46197 | 0.53896 | 0.61596 | 0.69295 | 0.76995 |
| 455 | 0.07785 | 0.15570 | 0.23355 | 0.31140 | 0.38925 | 0.46710 | 0.54495 | 0.62280 | 0.70065 | 0.77850 |
| 460 | 0.07870 | 0.15741 | 0.23612 | 0.31482 | 0.39353 | 0.47224 | 0.55094 | 0.62965 | 0.70835 | 0.78706 |
| 465 | 0.07956 | 0.15912 | 0.23868 | 0.31825 | 0.39781 | 0.47737 | 0.55693 | 0.63649 | 0.71605 | 0.79561 |
| 470 | 0.08041 | 0.16084 | 0.24125 | 0.32167 | 0.40208 | 0.48251 | 0.56292 | 0.64334 | 0.72375 | 0.80417 |
| 475 | 0.08127 | 0.16255 | 0.24382 | 0.32509 | 0.40636 | 0.48764 | 0.56890 | 0.65018 | 0.73145 | 0.81272 |
| 480 | 0.08212 | 0.16426 | 0.24638 | 0.32852 | 0.41064 | 0.49277 | 0.57489 | 0.65703 | 0.73915 | 0.82128 |
| 485 | 0.08298 | 0.16597 | 0.24895 | 0.33194 | 0.41491 | 0.49791 | 0.58088 | 0.66387 | 0.74685 | 0.82983 |
| 490 | 0.08383 | 0.16768 | 0.25151 | 0.33536 | 0.41919 | 0.50304 | 0.58687 | 0.67072 | 0.75455 | 0.83839 |
| 495 | 0.08469 | 0.16939 | 0.25408 | 0.33878 | 0.42347 | 0.50817 | 0.59286 | 0.67756 | 0.76225 | 0.84694 |
| 500 | 0.08555 | 0.17110 | 0.25665 | 0.34220 | 0.42775 | 0.51330 | 0.59885 | 0.68440 | 0.76995 | 0.85550 |
| 505 | 0.08640 | 0.17281 | 0.25922 | 0.34562 | 0.43203 | 0.51843 | 0.60484 | 0.69124 | 0.77765 | 0.86405 |
| 510 | 0.08726 | 0.17452 | 0.26178 | 0.34904 | 0.43631 | 0.52357 | 0.61083 | 0.69809 | 0.78535 | 0.87261 |
| 515 | 0.08811 | 0.17623 | 0.26435 | 0.35247 | 0.44059 | 0.52870 | 0.61682 | 0.70493 | 0.79305 | 0.88116 |
| 520 | 0.08897 | 0.17795 | 0.26692 | 0.35589 | 0.44486 | 0.53384 | 0.62280 | 0.71178 | 0.80075 | 0.88972 |
| 525 | 0.08982 | 0.17966 | 0.26948 | 0.35931 | 0.44914 | 0.53897 | 0.62879 | 0.71862 | 0.80844 | 0.89827 |

| Millimetres. | Degrees. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. |
| 530 | 0.09068 | 0.18137 | 0.27205 | 0.36274 | 0.45342 | 0.54410 | 0.63478 | 0.72547 | 0.81614 | 0.90683 |
| 535 | 0.09153 | 0.18308 | 0.27461 | 0.36616 | 0.45769 | 0.54924 | 0.64076 | 0.73231 | 0.82384 | 0.91538 |
| 540 | 0 09239 | 0.18479 | 0.27718 | 0.36958 | 0.46197 | 0.55437 | 0.64675 | 0.73916 | 0.83154 | 0.92394 |
| 545 | 0.09324 | 0.18650 | 0.27974 | 0.37300 | 0.46625 | 0.55950 | 0.65274 | 0.74600 | 0.83924 | 0.93249 |
| 550 | 0.09410 | 0.18821 | 0.28231 | 0.37642 | 0.47052 | 0.56463 | 0.65873 | 0.75284 | 0.84694 | 0.94105 |
| 555 | 0.09496 | 0.18992 | 0.28488 | 0.37984 | 0.47480 | 0.56976 | 0.66472 | 0.75968 | 0.85464 | 0.94960 |
| 560 | 0.09581 | 0.19163 | 0.28745 | 0.38326 | 0.47908 | 0.57490 | 0.67071 | 0.76653 | 0.86234 | 0.95816 |
| 565 | 0.09667 | 0.19334 | 0.29001 | 0.38669 | 0.48336 | 0.58003 | 0.67670 | 0.77337 | 0.87004 | 0.96671 |
| 570 | 0.09752 | 0.19506 | 0.29258 | 0.39011 | 0.48763 | 0.58517 | 0.68269 | 0.78022 | 0.87774 | 0.97527 |
| 575 | 0.09838 | 0.19677 | 0.29514 | 0.39353 | 0.49191 | 0.59030 | 0.68867 | 0.78706 | 0.88544 | 0.98382 |
| 580 | 0.09923 | 0.19848 | 0.29771 | 0.39696 | 0.49619 | 0.59543 | 0.69466 | 0.79391 | 0.89314 | 0.99238 |
| 585 | 0.10009 | 0.20019 | 0.30027 | 0.40038 | 0.50047 | 0.60057 | 0.70065 | 0.80075 | 0.90084 | 1.00093 |
| 590 | 0.10094 | 0.20190 | 0.30284 | 0.40380 | 0.50474 | 0.60570 | 0.70664 | 0.80760 | 0.90854 | 1.00949 |
| 595 | 0.10180 | 0.20361 | 0.30540 | 0.40722 | 0.50902 | 0.61083 | 0.71263 | 0.81444 | 0.91624 | 1.01804 |
| 600 | 0.10266 | 0.20532 | 0.30798 | 0.41064 | 0.51330 | 0.61596 | 0.71862 | 0.82128 | 0.92394 | 1.02660 |
| 605 | 0.10351 | 0.20703 | 0.31055 | 0.41406 | 0.51758 | 0.62109 | 0.72461 | 0.82812 | 0.93164 | 1.03515 |
| 610 | 0.10437 | 0.20874 | 0.31311 | 0.41748 | 0.52186 | 0.62623 | 0.73060 | 0.83497 | 0.93934 | 1.04371 |
| 615 | 0.10522 | 0.21045 | 0.31568 | 0.42091 | 0.52614 | 0.63136 | 0.73659 | 0.84181 | 0.94704 | 1.05226 |
| 620 | 0.10608 | 0.21217 | 0.31825 | 0.42433 | 0.53041 | 0.63650 | 0.74257 | 0.84866 | 0.95474 | 1.06082 |
| 625 | 0.10693 | 0.21388 | 0.32081 | 0.42775 | 0.53469 | 0.64163 | 0.74856 | 0.85550 | 0.96243 | 1.06937 |
| 630 | 0.10779 | 0.21559 | 0.32337 | 0.43118 | 0.53897 | 0.64676 | 0.75455 | 0.86235 | 0.97013 | 1.07793 |
| 635 | 0.10864 | 0.21730 | 0.32594 | 0.43460 | 0.54324 | 0.65190 | 0.76053 | 0.86919 | 0.97783 | 1.08648 |
| 640 | 0.10950 | 0.21901 | 0.32850 | 0.43802 | 0.54752 | 0.65703 | 0.76652 | 0.87604 | 0.98553 | 1.09504 |
| 645 | 0.11035 | 0.22072 | 0.32107 | 0.44144 | 0.55180 | 0.66216 | 0.77251 | 0.88288 | 0.99323 | 1.10359 |
| 650 | 0.11121 | 0.22243 | 0.33364 | 0.44486 | 0.55607 | 0.66729 | 0.77850 | 0.88972 | 1.00093 | 1.11215 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 655 | 0.11207 | 0.22414 | 0.33621 | 0.44828 | 0.56035 | 0.67242 | 0.78449 | 0.89656 | 1.00863 | 1.12070 |
| 660 | 0.11292 | 0.22585 | 0.33877 | 0.45170 | 0.56463 | 0.67756 | 0.79048 | 0.90341 | 1.01633 | 1.12926 |
| 665 | 0.11378 | 0.22756 | 0.34134 | 0.45513 | 0.56891 | 0.68269 | 0.79647 | 0.91025 | 1.02403 | 1.13781 |
| 670 | 0.11463 | 0.22928 | 0.34391 | 0.45855 | 0.57318 | 0.68783 | 0.80246 | 0.91710 | 1.03173 | 1.14637 |
| 675 | 0.11549 | 0.23099 | 0.34647 | 0.46197 | 0.57746 | 0.69296 | 0.80844 | 0.92394 | 1.03943 | 1.15492 |
| 680 | 0.11634 | 0.23270 | 0.34904 | 0.46540 | 0.58174 | 0.69809 | 0.81443 | 0.93079 | 1.04713 | 1.16348 |
| 685 | 0.11720 | 0.23441 | 0.35160 | 0.46882 | 0.58602 | 0.70323 | 0.82042 | 0.93763 | 1.05483 | 1.17203 |
| 690 | 0.11805 | 0.23612 | 0.35417 | 0.47224 | 0.59029 | 0.70836 | 0.82641 | 0.94448 | 1.06253 | 1.18059 |
| 695 | 0.11891 | 0.23783 | 0.35673 | 0.47566 | 0.59457 | 0.71349 | 0.83240 | 0.95132 | 1.07023 | 1.18914 |
| 700 | 0.11977 | 0.23954 | 0.35931 | 0.47908 | 0.59885 | 0.71862 | 0.83839 | 0.95816 | 1.07793 | 1.19770 |
| 705 | 0.12062 | 0.24125 | 0.36188 | 0.48250 | 0.60313 | 0.72375 | 0.84438 | 0.96500 | 1.08563 | 1.20625 |
| 710 | 0.12148 | 0.24296 | 0.36444 | 0.48592 | 0.60741 | 0.72889 | 0.85037 | 0.97185 | 1.09333 | 1.21481 |
| 715 | 0.12233 | 0.24467 | 0.36701 | 0.48935 | 0.61169 | 0.73402 | 0.85636 | 0.97869 | 1.10103 | 1.22336 |
| 720 | 0.12319 | 0.24639 | 0.36958 | 0.49277 | 0.61596 | 0.73916 | 0.86234 | 0.98554 | 1.10873 | 1.23192 |
| 725 | 0.12404 | 0.24810 | 0.37214 | 0.49619 | 0.62024 | 0.74429 | 0.86833 | 0.99238 | 1.11642 | 1.24047 |
| 730 | 0.12490 | 0.24981 | 0.37471 | 0.49962 | 0.62452 | 0.74942 | 0.87432 | 0.99923 | 1.12412 | 1.24903 |
| 735 | 0.12575 | 0.25152 | 0.37727 | 0.50304 | 0.62880 | 0.75456 | 0.88030 | 1.00607 | 1.13182 | 1.25758 |
| 740 | 0.12661 | 0.25323 | 0.37984 | 0.50646 | 0.63307 | 0.75969 | 0.88629 | 1.01292 | 1.13952 | 1.26614 |
| 745 | 0.12746 | 0.25494 | 0.38240 | 0.50988 | 0.63735 | 0.76482 | 0.89228 | 1.01976 | 1.14722 | 1.27469 |
| 750 | 0.12832 | 0.25665 | 0.38497 | 0.51330 | 0.64162 | 0.76995 | 0.89827 | 1.02660 | 1.15492 | 1.28325 |
| 755 | 0.12918 | 0.25836 | 0.38754 | 0.51672 | 0.64590 | 0.77508 | 0.90426 | 1.03344 | 1.16262 | 1.29180 |
| 760 | 0.13003 | 0.26007 | 0.39011 | 0.52014 | 0.65018 | 0.78022 | 0.91025 | 1.04029 | 1.17032 | 1.30036 |
| 765 | 0.13089 | 0.26178 | 0.39267 | 0.52357 | 0.65446 | 0.78535 | 0.91624 | 1.04713 | 1.17802 | 1.30891 |
| 770 | 0.13174 | 0.26350 | 0.39524 | 0.52699 | 0.65873 | 0.79049 | 0.92223 | 1.05398 | 1.18572 | 1.31747 |
| 775 | 0.13260 | 0.26521 | 0.39781 | 0.53041 | 0.66301 | 0.79562 | 0.92821 | 1.06082 | 1.19342 | 1.32602 |
| 780 | 0.13345 | 0.26692 | 0.40037 | 0.53383 | 0.66729 | 0.80075 | 0.93420 | 1.06767 | 1.20112 | 1.33458 |
| 785 | 0.13431 | 0.26863 | 0.40294 | 0.53725 | 0.67157 | 0.80589 | 0.94019 | 1.07451 | 1.20882 | 1.34313 |
| 790 | 0.13516 | 0.27034 | 0.40550 | 0.54067 | 0.67584 | 0.81102 | 0.94618 | 1.08136 | 1.21652 | 1.35169 |
| 795 | 0.13602 | 0.27205 | 0.40707 | 0.54409 | 0.68012 | 0.81615 | 0.95217 | 1.08820 | 1.22422 | 1.36024 |
| 800 | 0.13688 | 0.27376 | 0.41064 | 0.54752 | 0.68440 | 0.82128 | 0.95816 | 1.09504 | 1.23192 | 1.36880 |

| Millimetres. | Degrees. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. |
| 805 | 0.13773 | 0.27547 | 0.41321 | 0.55094 | 0.68868 | 0.82641 | 0.96415 | 1.10118 | 1.23962 | 1.37735 |
| 810 | 0.13859 | 0.27718 | 0.41577 | 0.55436 | 0.69296 | 0.83155 | 0.97014 | 1.10873 | 1.24732 | 1.38591 |
| 815 | 0.13944 | 0.27889 | 0.41834 | 0.55779 | 0.69724 | 0.83668 | 0.97613 | 1.11557 | 1.25502 | 1.39446 |
| 820 | 0.14030 | 0.28061 | 0.42091 | 0.56121 | 0.70151 | 0.84182 | 0.98211 | 1.12242 | 1.26272 | 1.40302 |
| 825 | 0.14115 | 0.28232 | 0.42347 | 0.56463 | 0.70579 | 0.84695 | 0.98810 | 1.12926 | 1.27041 | 1.41157 |
| 830 | 0.14201 | 0.28403 | 0.42604 | 0.56806 | 0.71007 | 0.85208 | 0.99409 | 1.13611 | 1.27811 | 1.42013 |
| 835 | 0.14286 | 0.28574 | 0.42860 | 0.57148 | 0.71435 | 0.85722 | 1.00007 | 1.14295 | 1.28581 | 1.42868 |
| 840 | 0.14372 | 0.28745 | 0.43117 | 0.57490 | 0.71862 | 0.86235 | 1.00606 | 1.14980 | 1.29351 | 1.43724 |
| 845 | 0.14457 | 0.28916 | 0.43373 | 0.57832 | 0.72290 | 0.86748 | 1.01205 | 1.15664 | 1.30121 | 1.44579 |
| 850 | 0.14543 | 0.29087 | 0.43630 | 0.58174 | 0.72717 | 0.87261 | 1.01804 | 1.16348 | 1.30891 | 1.45435 |
| 855 | 0.14629 | 0.29258 | 0.43887 | 0.58516 | 0.73145 | 0.87774 | 1.02403 | 1.17032 | 1.31661 | 1.46290 |
| 860 | 0.14714 | 0.29429 | 0.44144 | 0.58858 | 0.73573 | 0.88288 | 1.03002 | 1.17717 | 1.32431 | 1.47146 |
| 865 | 0.14800 | 0.29600 | 0.44400 | 0.59201 | 0.74001 | 0.88801 | 1.03601 | 1.18401 | 1.33201 | 1.48001 |
| 870 | 0.14885 | 0.29772 | 0.44657 | 0.59543 | 0.74428 | 0.89315 | 1.04200 | 1.19086 | 1.33971 | 1.48857 |
| 875 | 0.14971 | 0.29943 | 0.44914 | 0.59885 | 0.74856 | 0.89828 | 1.04798 | 1.19770 | 1.34741 | 1.49712 |
| 880 | 0.15056 | 0.30114 | 0.45170 | 0.60228 | 0.75284 | 0.90341 | 1.05397 | 1.20455 | 1.35511 | 1.50568 |
| 885 | 0.15142 | 0.30285 | 0.45427 | 0.60570 | 0.75712 | 0.90855 | 1.05996 | 1.21139 | 1.36281 | 1.51423 |
| 890 | 0.15227 | 0.30456 | 0.45683 | 0.60912 | 0.76139 | 0.91368 | 1.06595 | 1.21824 | 1.37051 | 1.52279 |
| 895 | 0.15313 | 0.30627 | 0.45940 | 0.61354 | 0.76567 | 0.91881 | 1.07194 | 1.22508 | 1.37821 | 1.53134 |
| 900 | 0.15399 | 0.30798 | 0.46197 | 0.61596 | 0.76995 | 0.92394 | 1.07793 | 1.23192 | 1.38591 | 1.53990 |
| 905 | 0.15484 | 0.30969 | 0.46454 | 0.61938 | 0.77423 | 0.92907 | 1.08392 | 1.23876 | 1.39361 | 1.54845 |
| 910 | 0.15570 | 0.31140 | 0.46710 | 0.62280 | 0.77851 | 0.93421 | 1.08991 | 1.24561 | 1.40131 | 1.55701 |
| 915 | 0.15655 | 0.31311 | 0.46967 | 0.62623 | 0.78279 | 0.93934 | 1.09490 | 1.25245 | 1.40901 | 1.56556 |
| 920 | 0.15741 | 0.31483 | 0.47224 | 0.62965 | 0.78706 | 0.94448 | 1.10188 | 1.25930 | 1.41671 | 1.57412 |
| 925 | 0.15826 | 0.31654 | 0.47480 | 0.63307 | 0.79134 | 0.94961 | 1.10787 | 1.26614 | 1.42440 | 1.58267 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 930 | 0.15912 | 0.31825 | 0.47737 | 0.63650 | 0.79562 | 0.95474 | 1.11386 | 1.27299 | 1.43210 | 1.59123 |
| 935 | 0.15997 | 0.31996 | 0.47993 | 0.63992 | 0.79989 | 0.95988 | 1.11984 | 1.27988 | 1.43980 | 1.59978 |
| 940 | 0.16083 | 0.32167 | 0.48250 | 0.64334 | 0.80417 | 0.96501 | 1.12583 | 1.28668 | 1.44750 | 1.60834 |
| 945 | 0.16168 | 0.32338 | 0.48506 | 0.64676 | 0.80845 | 0.97014 | 1.13182 | 1.29352 | 1.45520 | 1.61689 |
| 950 | 0.16254 | 0.32509 | 0.48763 | 0.65018 | 0.81273 | 0.97527 | 1.13781 | 1.30036 | 1.46290 | 1.62545 |
| 955 | 0.16339 | 0.32680 | 0.49020 | 0.65360 | 0.81701 | 0.98040 | 1.14380 | 1.30720 | 1.47060 | 1.63400 |
| 960 | 0.16425 | 0.32851 | 0.49277 | 0.65708 | 0.82129 | 0.98554 | 1.14979 | 1.31405 | 1.47830 | 1.64256 |
| 965 | 0.16510 | 0.33022 | 0.49533 | 0.66045 | 0.82557 | 0.99067 | 1.15578 | 1.32089 | 1.48600 | 1.65111 |
| 970 | 0.16596 | 0.33193 | 0.49790 | 0.66387 | 0.82984 | 0.99581 | 1.16177 | 1.32774 | 1.49370 | 1.65967 |
| 975 | 0.16681 | 0.33364 | 0.50047 | 0.66729 | 0.83412 | 1.00094 | 1.16775 | 1.33458 | 1.50140 | 1.66822 |
| 980 | 0.16767 | 0.33535 | 0.50303 | 0.67072 | 0.83840 | 1.00607 | 1.17374 | 1.34143 | 1.50910 | 1.67678 |
| 985 | 0.16852 | 0.33706 | 0.50560 | 0.67414 | 0.84268 | 1.01121 | 1.17973 | 1.34827 | 1.51680 | 1.68533 |
| 990 | 0.16938 | 0.33877 | 0.50816 | 0.67756 | 0.84695 | 1.01634 | 1.18572 | 1.35512 | 1.52450 | 1.69389 |
| 995 | 0.17023 | 0.34048 | 0.51073 | 0.68098 | 0.85123 | 1.02147 | 1.19171 | 1.36196 | 1.53220 | 1.70244 |
| 1000 | 0.17110 | 0.34220 | 0.51330 | 0.68440 | 0.85550 | 1.02660 | 1.19770 | 1.36880 | 1.53990 | 1.71100 |

# TABLE

FOR THE REDUCTION OF THE BAROMETRICAL COLUMN, MEASURED BY A BRASS SCALE EXTENDING FROM THE CISTERN TO THE TOP, TO 0° CENTIGRADE.

M. T. DELCROS. — (Guyot's Tables.)

| Height of the Barometer. | Degrees, Centigrade. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. |
| 665 | 0.1073 | 0.2146 | 0.3220 | 0.4293 | 0.537 | 0.644 | 0.751 | 0.859 | 0.966 |
| 670 | 0.1081 | 0.2163 | 0.3244 | 0.4326 | 0.541 | 0.649 | 0.757 | 0.865 | 0.973 |
| 675 | 0.1089 | 0.2179 | 0.3268 | 0.4358 | 0.545 | 0.654 | 0.763 | 0.871 | 0.980 |
| 680 | 0.1097 | 0.2195 | 0.3292 | 0.4390 | 0.549 | 0.658 | 0.768 | 0.878 | 0.988 |
| 685 | 0.1106 | 0.2211 | 0.3317 | 0.4423 | 0.553 | 0.663 | 0.774 | 0.884 | 0.995 |
| 690 | 0.1114 | 0.2227 | 0.3341 | 0.4455 | 0.557 | 0.668 | 0.780 | 0.891 | 1.002 |
| 695 | 0.1122 | 0.2243 | 0.3365 | 0.4487 | 0.561 | 0.673 | 0.785 | 0.897 | 1.010 |
| 700 | 0.1130 | 0.2260 | 0.3389 | 0.4520 | 0.565 | 0.678 | 0.791 | 0.904 | 1.017 |
| 705 | 0.1138 | 0.2276 | 0.3414 | 0.4552 | 0.569 | 0.683 | 0.797 | 0.910 | 1.024 |
| 710 | 0.1146 | 0.2292 | 0.3438 | 0.4584 | 0.573 | 0.688 | 0.802 | 0.917 | 1.031 |
| 715 | 0.1154 | 0.2308 | 0.3462 | 0.4616 | 0.577 | 0.691 | 0.808 | 0.923 | 1.039 |
| 720 | 0.1162 | 0.2324 | 0.3486 | 0.4648 | 0.581 | 0.697 | 0.813 | 0.930 | 1.046 |
| 725 | 0.1170 | 0.2340 | 0.3510 | 0.4680 | 0.585 | 0.702 | 0.819 | 0.936 | 1.053 |
| 730 | 0.1178 | 0.2356 | 0.3535 | 0.4713 | 0.589 | 0.707 | 0.825 | 0.943 | 1.060 |
| 735 | 0.1186 | 0.2372 | 0.3559 | 0.4745 | 0.593 | 0.712 | 0.830 | 0.949 | 1.068 |
| 740 | 0.1194 | 0.2389 | 0.3583 | 0.4777 | 0.597 | 0.717 | 0.836 | 0.955 | 1.075 |
| 745 | 0.1202 | 0.2405 | 0.3607 | 0.4809 | 0.601 | 0.721 | 0.842 | 0.962 | 1.082 |
| 750 | 0.1210 | 0.2421 | 0.3631 | 0.4842 | 0.605 | 0.726 | 0.847 | 0.968 | 1.089 |
| 755 | 0.1218 | 0.2437 | 0.3655 | 0.4874 | 0.609 | 0.731 | 0.853 | 0.975 | 1.097 |
| 760 | 0.1227 | 0.2453 | 0.3680 | 0.4906 | 0.613 | 0.736 | 0.859 | 0.981 | 1.104 |
| 765 | 0.1235 | 0.2469 | 0.3704 | 0.4939 | 0.617 | 0.741 | 0.864 | 0.988 | 1.111 |
| 770 | 0.1243 | 0.2486 | 0.3728 | 0.4971 | 0.621 | 0.746 | 0.870 | 0.994 | 1.118 |
| 775 | 0.1251 | 0.2502 | 0.3752 | 0.5003 | 0.625 | 0.750 | 0.876 | 1.001 | 1.126 |
| 780 | 0.1259 | 0.2518 | 0.3777 | 0.5036 | 0.629 | 0.755 | 0.881 | 1.007 | 1.133 |
| 785 | 0.1267 | 0.2534 | 0.3801 | 0.5068 | 0.633 | 0.760 | 0.888 | 1.014 | 1.140 |
| 790 | 0.1275 | 0.2550 | 0.3825 | 0.5100 | 0.637 | 0.765 | 0.893 | 1.020 | 1.148 |
| 795 | 0.1283 | 0.2566 | 0.3849 | 0.5132 | 0.641 | 0.770 | 0.898 | 1.026 | 1.155 |
| 800 | 0.1291 | 0.2582 | 0.3874 | 0.5165 | 0.646 | 0.775 | 0.904 | 1.033 | 1.162 |
| 805 | 0.1299 | 0.2598 | 0.3898 | 0.5197 | 0.650 | 0.780 | 0.909 | 1.039 | 1.169 |

# TABLE

## FOR THE REDUCTION OF WATER PRESSURE TO MERCURY PRESSURE.

BUNSEN. — Gasometrische Methoden.

| Water Pressure. | Mercury Pressure. | Water Pressure. | Mercury Pressure. | Water Pressure. | Mercury Pressure. | Water Pressure. | Mercury Pressure. |
|---|---|---|---|---|---|---|---|
| mm. | mm. | mm. | mm. | mm. | mm. | mm. | mm. |
| 1 | 0.07 | 29 | 2.14 | 56 | 4.13 | 83 | 6.13 |
| 2 | 0.15 | 30 | 2.21 | 57 | 4.21 | 84 | 6.20 |
| 3 | 0.22 | 31 | 2.29 | 58 | 4.28 | 85 | 6.27 |
| 4 | 0.30 | 32 | 2.36 | 59 | 4.35 | 86 | 6.35 |
| 5 | 0.37 | 33 | 2.44 | 60 | 4.43 | 87 | 6.42 |
| 6 | 0.44 | 34 | 2.51 | 61 | 4.50 | 88 | 6.49 |
| 7 | 0.52 | 35 | 2.58 | 62 | 4.58 | 89 | 6.57 |
| 8 | 0.59 | 36 | 2.66 | 63 | 4.65 | 90 | 6.64 |
| 9 | 0.66 | 37 | 2.73 | 64 | 4.72 | 91 | 6.72 |
| 10 | 0.74 | 38 | 2.80 | 65 | 4.80 | 92 | 6.79 |
| 11 | 0.81 | 39 | 2.88 | 66 | 4.87 | 93 | 6.86 |
| 12 | 0.89 | 40 | 2.95 | 67 | 4.94 | 94 | 6.94 |
| 13 | 0.96 | 41 | 3.03 | 68 | 5.02 | 95 | 7.01 |
| 14 | 1.03 | 42 | 3.10 | 69 | 5.09 | 96 | 7.08 |
| 15 | 1.12 | 43 | 3.17 | 70 | 5.17 | 97 | 7.16 |
| 16 | 1.18 | 44 | 3.25 | 71 | 5.24 | 98 | 7.23 |
| 17 | 1.26 | 45 | 3.32 | 72 | 5.31 | 99 | 7.31 |
| 18 | 1.33 | 46 | 3.39 | 73 | 5.39 | 100 | 7.38 |
| 19 | 1.40 | 47 | 3.47 | 74 | 5.46 | 200 | 14.76 |
| 20 | 1.48 | 48 | 3.54 | 75 | 5.54 | 300 | 22.14 |
| 21 | 1.55 | 49 | 3.62 | 76 | 5.61 | 400 | 29.52 |
| 22 | 1.62 | 50 | 3.69 | 77 | 5.68 | 500 | 36.90 |
| 23 | 1.70 | 51 | 3.76 | 78 | 5.76 | 600 | 44.28 |
| 24 | 1.77 | 52 | 3.84 | 79 | 5.83 | 700 | 51.66 |
| 25 | 1.84 | 53 | 3.91 | 80 | 5.90 | 800 | 59.04 |
| 26 | 1.92 | 54 | 3.99 | 81 | 5.98 | 900 | 66.42 |
| 27 | 1.98 | 55 | 4.06 | 82 | 6.05 | 1000 | 73.80 |
| 28 | 2.07 | | | | | | |

CORRECTION FOR THE DEPRESSION OF THE BARO-

M. T. DELCROS.—

| Radius of the tube in Millimetres. | Height of the Meniscus in Millimetres. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0 1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 1.0 | 1.268 | 2.460 | 3.516 | 4.396 | 5.085 | | | | |
| 1.2 | 0.876 | 1.715 | 2.484 | 3.162 | 3.728 | 4.190 | | | |
| 1.4 | 0.638 | 1.256 | 1.836 | 2.363 | 2.825 | 3.218 | 3.542 | | |
| 1.6 | 0.484 | 0.955 | 1.404 | 1.820 | 2.196 | 2.528 | 2.812 | 3.050 | |
| 1.8 | 0.378 | 0.747 | 1.103 | 1.437 | 1.746 | 2.024 | 2.270 | 2.483 | 2.662 |
| 2.0 | 0.302 | 0.598 | 0.885 | 1.158 | 1.413 | 1.648 | 1.859 | 2.046 | 2.209 |
| 2.2 | 0.245 | 0.487 | 0.723 | 0.948 | 1.161 | 1.360 | 1.541 | 1.705 | 1.851 |
| 2.4 | 0.203 | 0.403 | 0.599 | 0.787 | 0.966 | 1.135 | 1.292 | 1.436 | 1.565 |
| 2.6 | 0.170 | 0.337 | 0.502 | 0.661 | 0.813 | 0.958 | 1.093 | 1.218 | 1.332 |
| 2.8 | 0.143 | 0.285 | 0.425 | 0.560 | 0.691 | 0.815 | 0.932 | 1.041 | 1.142 |
| 3.0 | 0.122 | 0.243 | 0.362 | 0.478 | 0.591 | 0.698 | 0.800 | 0.896 | 0.985 |
| 3.2 | 0.105 | 0.209 | 0.312 | 0.412 | 0.509 | 0.602 | 0.691 | 0.776 | 0.855 |
| 3.4 | 0.091 | 0.181 | 0.269 | 0.356 | 0.441 | 0.523 | 0.601 | 0.675 | 0.745 |
| 3.6 | 0.079 | 0.157 | 0.234 | 0.310 | 0.384 | 0.455 | 0.524 | 0.590 | 0.652 |
| 3.8 | 0.069 | 0.137 | 0.205 | 0.271 | 0.336 | 0.399 | 0.459 | 0.517 | 0.572 |
| 4.0 | 0.060 | 0.120 | 0.180 | 0.238 | 0.295 | 0.350 | 0.404 | 0.455 | 0.504 |
| 4.2 | 0.053 | 0.106 | 0.158 | 0.210 | 0.260 | 0.309 | 0.356 | 0.402 | 0.446 |
| 4.4 | 0.047 | 0.094 | 0.140 | 0.185 | 0.230 | 0.273 | 0.315 | 0.356 | 0.395 |
| 4.6 | 0.042 | 0.083 | 0.124 | 0.164 | 0.204 | 0.242 | 0.280 | 0 316 | 0.351 |
| 4.8 | 0.037 | 0.074 | 0.110 | 0.146 | 0.181 | 0.215 | 0.249 | 0.281 | 0.312 |
| 5.0 | 0.033 | 0.065 | 0.098 | 0.130 | 0.161 | 0.192 | 0.221 | 0.250 | 0.278 |
| 5.2 | 0.029 | 0.058 | 0.087 | 0.116 | 0.144 | 0.171 | 0.198 | 0.224 | 0.248 |
| 5.4 | 0.026 | 0.052 | 0.078 | 0.103 | 0.128 | 0.153 | 0.177 | 0.200 | 0.222 |
| 5.6 | 0.023 | 0.047 | 0.070 | 0.092 | 0.115 | 0.137 | 0.158 | 0.179 | 0.199 |
| 5.8 | 0.021 | 0.042 | 0.062 | 0.083 | 0.103 | 0.122 | 0.142 | 0.160 | 0.178 |
| 6.0 | 0.019 | 0.037 | 0.056 | 0.074 | 0.092 | 0.110 | 0.127 | 0.144 | 0.160 |
| 6.2 | 0.017 | 0.034 | 0.050 | 0.067 | 0.083 | 0.099 | 0.114 | 0.129 | 0.144 |
| 6.4 | 0.015 | 0.030 | 0.045 | 0.060 | 0.074 | 0.089 | 0.103 | 0.116 | 0.130 |
| 6.6 | 0.014 | 0.027 | 0.041 | 0.054 | 0.067 | 0.080 | 0.093 | 0.105 | 0.117 |
| 6.8 | 0.012 | 0.024 | 0.037 | 0.049 | 0.061 | 0.072 | 0.084 | 0.095 | 0.105 |
| 7.0 | 0.011 | 0.022 | 0.033 | 0.044 | 0.055 | 0.065 | 0.075 | 0.085 | 0.095 |

## METRICAL COLUMN DUE TO CAPILLARY ACTION.

(Guyot's Tables.)

| Radius of the tube in Millimetres. | Height of the Meniscus in Millimetres. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 |
| 1.0 | | | | | | | | | |
| 1.2 | | | | | | | | | |
| 1.4 | | | | | | | | | |
| 1.6 | | | | | | | | | |
| 1.8 | | | | | | | | | |
| 2.0 | 2.348 | | | | | | | | |
| 2.2 | 1.978 | 2.087 | | | | | | | |
| 2.4 | 1.680 | 1.780 | 1.866 | | | | | | |
| 2.6 | 1.436 | 1.528 | 1.608 | 1.676 | | | | | |
| 2.8 | 1.235 | 1.318 | 1.392 | 1.456 | 1.511 | | | | |
| 3.0 | 1.068 | 1.143 | 1.210 | 1.270 | 1.322 | 1.368 | | | |
| 3.2 | 0.928 | 0.995 | 1.057 | 1.112 | 1.161 | 1.203 | 1.238 | | |
| 3.4 | 0.810 | 0.871 | 0.926 | 0.976 | 1.021 | 1.061 | 1.095 | | |
| 3.6 | 0.710 | 0.764 | 0.814 | 0.860 | 0.901 | 0.938 | 0.970 | | |
| 3.8 | 0.624 | 0.673 | 0.718 | 0 760 | 0.797 | 0.831 | 0.861 | 0.887 | |
| 4.0 | 0.551 | 0.594 | 0.635 | 0.673 | 0.707 | 0.738 | 0.766 | 0.790 | |
| 4.2 | 0.487 | 0.526 | 0.563 | 0.597 | 0.628 | 0.657 | 0.682 | 0.705 | |
| 4.4 | 0.432 | 0.467 | 0.500 | 0.531 | 0.559 | 0.585 | 0.609 | 0.630 | |
| 4.6 | 0.384 | 0.416 | 0.445 | 0.473 | 0.499 | 0.522 | 0.544 | 0.563 | |
| 4.8 | 0.342 | 0.370 | 0.397 | 0.422 | 0.445 | 0.467 | 0.486 | 0.504 | |
| 5.0 | 0.305 | 0.330 | 0.354 | 0.377 | 0.398 | 0.418 | 0.436 | 0.452 | |
| 5.2 | 0.272 | 0.295 | 0.317 | 0.337 | 0.356 | 0.374 | 0.390 | 0.405 | 0.418 |
| 5.4 | 0.244 | 0.264 | 0 284 | 0.302 | 0.319 | 0.336 | 0.350 | 0.364 | 0.376 |
| 5.6 | 0.218 | 0.237 | 0.255 | 0.271 | 0.287 | 0.301 | 0.315 | 0.327 | 0.338 |
| 5.8 | 0.196 | 0.213 | 0.228 | 0 243 | 0.257 | 0.271 | 0.283 | 0.294 | 0.304 |
| 6.0 | 0.176 | 0.191 | 0.205 | 0.219 | 0.231 | 0 243 | 0.254 | 0.264 | 0.273 |
| 6.2 | 0.158 | 0.172 | 0.185 | 0.197 | 0.208 | 0.219 | 0.229 | 0.238 | 0.246 |
| 6.4 | 0.142 | 0.154 | 0.166 | 0.177 | 0 187 | 0.197 | 0.206 | 0.214 | 0.221 |
| 6.6 | 0.128 | 0 139 | 0.150 | 0 160 | 0.169 | 0 178 | 0.186 | 0.193 | 0.200 |
| 6.8 | 0.116 | 0.126 | 0.135 | 0.144 | 0.153 | 0.160 | 0.168 | 0.174 | 0.180 |
| 7.0 | 0.105 | 0.114 | 0.122 | 0.130 | 0.138 | 0.145 | 0.152 | 0.158 | 0.163 |

# TABLE

## OF THE COEFFICIENTS OF ABSORPTION OF VARIOUS GASES.

BUNSEN. — Gasometrischer Tafeln.

| °C. | Nitrogen. | | Hydrogen. | | Oxygen. | |
|---|---|---|---|---|---|---|
| | In Water. | In Alcohol. | In Water. | In Alcohol. | In Water. | In Alcohol. |
| 0 | 0.02035 | 0.12634 | 0.01930 | 0.06925 | 0.04114 | 0.28397 |
| 1 | 0.01981 | 0.12593 | 0.01930 | 0.06910 | 0.04007 | 0.28397 |
| 2 | 0.01932 | 0.12553 | 0.01930 | 0.06896 | 0.03907 | 0.28397 |
| 3 | 0.01884 | 0.12514 | 0.01930 | 0.06881 | 0.03810 | 0.28397 |
| 4 | 0.01838 | 0.12476 | 0.01930 | 0.06867 | 0.03717 | 0.28397 |
| 5 | 0.01794 | 0.12440 | 0.01930 | 0.06853 | 0.03628 | 0.28397 |
| 6 | 0.01752 | 0.12405 | 0.01930 | 0.06839 | 0.03544 | 0.28397 |
| 7 | 0.01713 | 0.12371 | 0.01930 | 0.06826 | 0.03465 | 0.28397 |
| 8 | 0.01675 | 0.12338 | 0.01930 | 0.06813 | 0.03389 | 0.28397 |
| 9 | 0.01640 | 0.12306 | 0.01930 | 0.06799 | 0.03317 | 0 28397 |
| 10 | 0.01607 | 0.12276 | 0.01930 | 0.06786 | 0.03250 | 0.28397 |
| 11 | 0.01577 | 0.12247 | 0.01930 | 0.06774 | 0.03189 | 0.28397 |
| 12 | 0.01549 | 0.12219 | 0.01930 | 0.06761 | 0.03133 | 0.28397 |
| 13 | 0.01523 | 0.12192 | 0.01930 | 0.06749 | 0.03082 | 0.28397 |
| 14 | 0.01500 | 0.12166 | 0.01930 | 0.06737 | 0.03034 | 0.28397 |
| 15 | 0.01478 | 0.12142 | 0.01930 | 0.06725 | 0.02989 | 0.28397 |
| 16 | 0.01458 | 0.12119 | 0.01930 | 0.06713 | 0.02949 | 0.28397 |
| 17 | 0.01441 | 0.12097 | 0.01930 | 0.06701 | 0.02914 | 0.28397 |
| 18 | 0.01426 | 0.12076 | 0.01930 | 0.06690 | 0.02884 | 0.28397 |
| 19 | 0.01413 | 0.12056 | 0.01930 | 0.06679 | 0.02858 | 0.28397 |
| 20 | 0.01403 | 0.12038 | 0.01930 | 0.06668 | 0 02838 | 0.28397 |
| 21 | | 0.12021 | 0.01930 | 0.06657 | | |
| 22 | | 0.12005 | 0 01930 | 0.06646 | | |
| 23 | | 0.11990 | 0.01930 | 0 06636 | | |
| 24 | | 0.11976 | 0.01930 | 0.06626 | | |

| °C. | Carbonic Acid. | | Carbonic Oxide. | | Protoxide of Nitrogen. | | Deutoxide of Nitrogen in Alcohol. |
|---|---|---|---|---|---|---|---|
| | In Water. | In Alcohol. | In Water. | In Alcohol. | In Water. | In Alcohol. | |
| 0 | 1.7967 | 4.3295 | 0.03287 | 0.20443 | 1.3052 | 4.1780 | 0.31606 |
| 1 | 1.7207 | 4.2368 | 0.03207 | 0.20443 | 1.2605 | 4.1088 | 0.31262 |
| 2 | 1.6481 | 4.1466 | 0.03131 | 0.20443 | 1.2172 | 4.0409 | 0.30928 |
| 3 | 1.5787 | 4.0589 | 0.03057 | 0.20443 | 1.1752 | 3.9741 | 0.30604 |
| 4 | 1.5126 | 3.9736 | 0.02987 | 0.20443 | 1.1346 | 3.9085 | 0.30290 |
| 5 | 1.4497 | 3.8908 | 0.02920 | 0.20443 | 1.0954 | 3.8442 | 0.29985 |
| 6 | 1.3901 | 3.8105 | 0.02857 | 0.20443 | 1.0575 | 3.7811 | 0.29690 |
| 7 | 1.3339 | 3.7327 | 0.02796 | 0.20443 | 1.0210 | 3.7192 | 0.29405 |
| 8 | 1.2809 | 3.6573 | 0.02739 | 0.20443 | 0.9858 | 3.6585 | 0.29130 |
| 9 | 1.2311 | 3.5844 | 0.02686 | 0.20443 | 0.9520 | 3.5990 | 0.28865 |
| 10 | 1.1847 | 3.5140 | 0.02635 | 0.20443 | 0.9196 | 3.5408 | 0.28609 |
| 11 | 1.1416 | 3.4461 | 0.02588 | 0.20443 | 0.8885 | 3.4838 | 0.28363 |
| 12 | 1.1018 | 3.3807 | 0.02544 | 0.20443 | 0.8588 | 3.4279 | 0.28127 |
| 13 | 1.0653 | 3.3178 | 0.02504 | 0.20443 | 0.8304 | 3.3734 | 0.27901 |
| 14 | 1.0321 | 3.2573 | 0.02466 | 0.20443 | 0.8034 | 3.3200 | 0.27685 |
| 15 | 1.0020 | 3.1993 | 0.02432 | 0.20443 | 0.7778 | 3.2678 | 0.27478 |
| 16 | 0.9753 | 3.1438 | 0.02402 | 0.20443 | 0.7535 | 3.2169 | 0.27281 |
| 17 | 0.9519 | 3.0908 | 0.02374 | 0.20443 | 0.7306 | 3.1672 | 0.27094 |
| 18 | 0.9318 | 3.0402 | 0.02350 | 0.20443 | 0.7090 | 3.1187 | 0.26917 |
| 19 | 0.9150 | 2.9921 | 0.02329 | 0.20443 | 0.6888 | 3.0714 | 0.26750 |
| 20 | 0.9014 | 2.9465 | 0.02312 | 0.20443 | 0.6700 | 3.0253 | 0.26592 |
| 21 | | 2.9034 | | | 0.6525 | 2.9805 | 0.26444 |
| 22 | | 2.8628 | | | 0.6364 | 2.9368 | 0.26306 |
| 23 | | 2.8247 | | | 0.6216 | 2.8944 | 0.26178 |
| 24 | | 2.7890 | | | 0.6082 | 2.8532 | 0.26060 |

| °C. | Marsh Gas. | | Olefiant Gas. | | Ethyl in Water. | Methyl in Water. |
|---|---|---|---|---|---|---|
| | In Water. | In Alcohol. | In Water. | In Alcohol. | | |
| 0 | 0.05449 | 0.52259 | 0.2563 | 3.5950 | 0.03147 | 0.0871 |
| 1 | 0.05332 | 0.51973 | 0.2473 | 3.5379 | 0.03040 | 0.0838 |
| 2 | 0.05217 | 0.51691 | 0.2388 | 3.4823 | 0.02947 | 0.0807 |
| 3 | 0.05104 | 0.51412 | 0.2306 | 3.4280 | 0.02856 | 0.0777 |
| 4 | 0.04993 | 0.51135 | 0.2227 | 3.3750 | 0.02770 | 0.0748 |
| 5 | 0.04885 | 0.50861 | 0.2153 | 3.3234 | 0.02689 | 0.0720 |
| 6 | 0.04778 | 0.50590 | 0.2082 | 3.2732 | 0.02613 | 0.0693 |
| 7 | 0.04674 | 0.50322 | 0.2018 | 3.2243 | 0.02541 | 0.0668 |
| 8 | 0.04571 | 0.50057 | 0.1952 | 3.1768 | 0.02474 | 0.0644 |
| 9 | 0.04470 | 0.49795 | 0.1893 | 3.1307 | 0.02412 | 0.0621 |
| 10 | 0.04372 | 0.49535 | 0.1837 | 3.0859 | 0.02355 | 0.0599 |
| 11 | 0.04275 | 0.49278 | 0.1786 | 3.0425 | 0.02303 | 0.0578 |
| 12 | 0.04180 | 0.49024 | 0.1737 | 3.0005 | 0.02257 | 0.0559 |
| 13 | 0.04088 | 0.48773 | 0.1693 | 2.9598 | 0.02216 | 0.0541 |
| 14 | 0.03997 | 0.48525 | 0.1652 | 2.9205 | 0.02179 | 0.0524 |
| 15 | 0.03909 | 0.48280 | 0.1615 | 2.8825 | 0.02147 | 0.0508 |
| 16 | 0.03823 | 0.48037 | 0.1583 | 2.8459 | 0.02121 | 0.0493 |
| 17 | 0.03739 | 0.47798 | 0.1553 | 2.8107 | 0.02100 | 0.0480 |
| 18 | 0.03657 | 0.47561 | 0.1528 | 2.7768 | 0.02084 | 0.0468 |
| 19 | 0.03577 | 0.47327 | 0.1506 | 2.7443 | 0.02073 | 0.0457 |
| 20 | 0.03499 | 0.47096 | 0.1488 | 2.7131 | 0.02065 | 0.0447 |
| 21 | | 0.46867 | | 2.6833 | | |
| 22 | | 0.46642 | | 2.6549 | | |
| 23 | | 0.46419 | | 2.6279 | | |
| 24 | | 0.46199 | | 2.6022 | | |

| °C. | Sulphuretted Hydrogen. | | Sulphurous Acid. | | Ammonia in Water. | Atmospheric Air in Water. |
|---|---|---|---|---|---|---|
| | In Water | In Alcohol. | In Water. | In Alcohol. | | |
| 0 | 4.3706 | 17.891 | 68.861 | 328.62 | 1049.6 | 0.02471 |
| 1 | 4.2874 | 17.242 | 67.003 | 311.98 | 1020.8 | 0.02406 |
| 2 | 4.2053 | 16.606 | 65.169 | 295.97 | 993.3 | 0.02345 |
| 3 | 4.1243 | 15.983 | 63.360 | 280.58 | 967.0 | 0.02287 |
| 4 | 4.0442 | 15.373 | 61.576 | 265.81 | 941.9 | 0.02237 |
| 5 | 3.9652 | 14.776 | 59.816 | 241.67 | 917.9 | 0.02179 |
| 6 | 3.8872 | 14.193 | 58.080 | 238.16 | 895.0 | 0.02128 |
| 7 | 3.8103 | 13.623 | 56.369 | 225.25 | 873.1 | 0.02080 |
| 8 | 3.7345 | 13.066 | 54.683 | 212.98 | 852.1 | 0.02034 |
| 9 | 3.6596 | 12.523 | 53.021 | 201.33 | 832.0 | 0.01992 |
| 10 | 3.5858 | 11.992 | 51.383 | 190.31 | 812.8 | 0.01953 |
| 11 | 3.5132 | 11.475 | 49.770 | 179.91 | 794.3 | 0.01916 |
| 12 | 3.4415 | 10.971 | 48.182 | 170.13 | 776.6 | 0.01882 |
| 13 | 3.3708 | 10.480 | 46.618 | 160.98 | 759.6 | 0.01851 |
| 14 | 3.3012 | 10.003 | 45.079 | 152.45 | 743.1 | 0.01822 |
| 15 | 3.2326 | 9.539 | 43.564 | 144.55 | 727.2 | 0.01795 |
| 16 | 3.1651 | 9.088 | 42.073 | 137.27 | 711.8 | 0.01771 |
| 17 | 3.0986 | 8.650 | 40.608 | 130.61 | 696.9 | 0.01750 |
| 18 | 3.0331 | 8.225 | 39.165 | 124.58 | 682.3 | 0.01732 |
| 19 | 2.9687 | 7.814 | 37.749 | 119.17 | 668.0 | 0.01717 |
| 20 | 2.9053 | 7.415 | 36.216 | 114.48 | 654.0 | 0.01704 |
| 21 | 2.8430 | 7.030 | 34.986 | 110.22 | 640.2 | |
| 22 | 2.7817 | 6.659 | 33.910 | 106.68 | 626.5 | |
| 23 | 2.7215 | 6.300 | 32.847 | 103.77 | 613.0 | |
| 24 | 2.6623 | 5.955 | 31.800 | 101.47 | 599.5 | |

ESTIMATION OF THE WEIGHTS OF

| Name of Gas. | Formulas. | 1000 cc. | 2000 cc. | 3000 cc. |
|---|---|---|---|---|
| | | Grammes. | Grammes. | Grammes. |
| Chloride of Acetyl | $C_4H_4Cl$ | 2.79386 | 5.58772 | 8.38158 |
| Ethyl | $C_4H_5$ | 2.59349 | 5.18698 | 7.78047 |
| Ammonia | $H_3N$ | 0.76271 | 1.52542 | 2.28813 |
| Antimony | Sb | 23.06332 | 46.12664 | 69.18996 |
| Antimoniuretted Hydrogen | $H_3Sb$ | 5.90026 | 11.80052 | 17.70078 |
| Arsenic | As | 13.40892 | 26.81784 | 40.22676 |
| Arseniuretted Hydrogen | $H_3As$ | 3.48665 | 6.97330 | 10.45995 |
| Boron | B | 1.94876 | 3.89752 | 5.84628 |
| Chloride of Boron | $BCl_3$ | 5.24735 | 10.49470 | 15.74205 |
| Fluoride of Boron | $BF_3$ | 3.06166 | 6.12332 | 9.18498 |
| Bromine | Br | 6.99990 | 13.99980 | 20.99970 |
| Hydrobromic Acid | HBr | 3.54471 | 7.08942 | 10.63413 |
| Chlorine | Cl | 3.17344 | 6.34688 | 9.52032 |
| Oxychloride of Carbon | CClO | 4.42494 | 8.84988 | 13.27482 |
| Hydrochloric Acid | HCl | 1.63153 | 3.26306 | 4.89459 |
| Cyanogen | $C_2N$ | 2.32930 | 4.65860 | 6.98790 |
| Chloride of Cyanogen | $C_2NCl$ | 2.75137 | 5.50274 | 8.25411 |
| Ditetryl | $C_8H_9$ | 2.50388 | 5.00776 | 7.51164 |
| Elayl | $C_4H_4$ | 1.25194 | 2.50388 | 3.75582 |
| Fluorine | Fl | 1.71634 | 3.43268 | 5.14902 |
| Hydrofluoric Acid | HF | 0.90298 | 1.80596 | 2.70894 |
| Marsh gas | $C_2H_4$ | 0.71558 | 1.43116 | 2.14674 |
| Iodine | I | 11.36180 | 22.72360 | 34.08540 |
| Hydriodic Acid | HI | 5.72573 | 11.45146 | 17.17719 |
| Silicon | Si | 3.80814 | 7.61628 | 11.42442 |
| Fluoride of Silicon | $SiF_3$ | 4.70206 | 9.40412 | 14.10618 |
| Carbon | C | 1.07272 | 2.14544 | 3.21816 |
| Carbonic Oxide | CO | 1.25150 | 2.50300 | 3.75450 |
| Carbonic Acid | $CO_2$ | 1.97741 | 3.99482 | 5.93223 |
| Methyl | $C_2H_3$ | 1.34152 | 2.68304 | 4.02456 |
| Oxide of Methyl | $C_2H_3O$ | 2.05669 | 4.11338 | 6.17007 |
| Chloride of Methyl | $C_2H_3Cl$ | 2.25749 | 4.51498 | 6.77247 |
| Phosphorus | P | 5.54230 | 11.08460 | 16.62690 |
| Phosphuretted Hydrogen | $H_3P$ | 1.52000 | 3.04000 | 4.56000 |

GASES FROM THEIR VOLUMES.

| 4000 cc. | 5000 cc. | 6000 cc. | 7000 cc. | 8000 cc. | 9000 cc. |
|---|---|---|---|---|---|
| Grammes. | Grammes. | Grammes. | Grammes. | Grammes. | Grammes. |
| 11.17544 | 13.96930 | 16.76316 | 19.55702 | 22.35088 | 25.14474 |
| 10.37396 | 12.96745 | 15.56094 | 18.15443 | 20.74792 | 23.34141 |
| 3.05084 | 3.81355 | 4.57626 | 5.33897 | 6.10168 | 6.86439 |
| 92.25328 | 115.31660 | 138.37992 | 161.44324 | 184.50656 | 207.56992 |
| 23.60104 | 29.50130 | 35.40156 | 41.30182 | 47.20208 | 53.10234 |
| 53.63568 | 67.04460 | 80.45352 | 93.86244 | 107.27136 | 120.68028 |
| 13.94660 | 17.43325 | 20.91990 | 24.40650 | 27.89320 | 31.37985 |
| 7.79504 | 9.74380 | 11.69256 | 13.64132 | 15.59008 | 17.53884 |
| 20.98940 | 26.23675 | 31.48410 | 36.73145 | 41.97880 | 47.22615 |
| 12.24664 | 15.30830 | 18.36996 | 21.43162 | 24.49328 | 27.55494 |
| 27.99960 | 34.99950 | 41.99940 | 48.99930 | 55.99920 | 62.99910 |
| 14.17884 | 17.72355 | 21.26826 | 24.81297 | 28.35768 | 31.90239 |
| 12.69376 | 15.86720 | 19.04064 | 22.21408 | 25.38752 | 28.56096 |
| 17.69976 | 22.12470 | 26.54964 | 30.97458 | 35.39952 | 39.82446 |
| 6.52612 | 8.15765 | 9.78918 | 11.42071 | 13.05224 | 14.68377 |
| 9.31720 | 11.64650 | 13.97580 | 16.30510 | 18.63440 | 20.96370 |
| 11.00548 | 13.75685 | 16.50822 | 19.25959 | 22.01096 | 24.76233 |
| 10.01552 | 12.51940 | 15.02328 | 17.52716 | 20.03104 | 22.53492 |
| 5.00776 | 6.25970 | 7.51164 | 8.76356 | 10.01552 | 11.26746 |
| 6.86536 | 8.58170 | 10.29804 | 12.01438 | 13.73072 | 15.44706 |
| 3.61192 | 4.51490 | 5.41788 | 6.32086 | 7.22384 | 8.12682 |
| 2.86232 | 3.57790 | 4.29348 | 5.00906 | 5.72464 | 6.44022 |
| 45.44720 | 56.80900 | 68.17080 | 79.53260 | 90.89440 | 102.25620 |
| 22.90292 | 28.62865 | 34.35438 | 40.08011 | 45.80584 | 51.53157 |
| 15.23256 | 19.04070 | 22.84884 | 26.65698 | 30.46512 | 34.27326 |
| 18.80824 | 23.51030 | 28.21236 | 32.91442 | 37.61648 | 42.31854 |
| 4.29088 | 5.36360 | 6.43632 | 7.50904 | 8.58176 | 9.65448 |
| 5.00600 | 6.25750 | 7.50900 | 8.76050 | 10.01200 | 11.26350 |
| 7.98964 | 9.88705 | 1.86476 | 13.84187 | 15.81928 | 17.79669 |
| 5.36608 | 6.70760 | 8.04912 | 9.39064 | 10.73216 | 12.07368 |
| 8.22676 | 10.28345 | 12.34014 | 14.39683 | 16.45352 | 18.51021 |
| 9.02996 | 11.28745 | 13.54494 | 15.80243 | 18.05992 | 20.31741 |
| 22.16920 | 27.71150 | 33.25380 | 38.79610 | 44.33840 | 49.88070 |
| 6.08000 | 7.60000 | 9.12000 | 10·64000 | 12.16000 | 13.68000 |

| Name of Gas. | Formulas. | 1000 cc. | 2000 cc. | 3000 cc. |
|---|---|---|---|---|
| | | Grammes. | Grammes. | Grammes. |
| Oxygen | O | 1.42980 | 2.85960 | 4.28941 |
| Sulphur | S | 17.16336 | 34.32672 | 51.49008 |
| Sulphurous Acid | $SO_2$ | 2.86056 | 5.72112 | 8.58168 |
| Sulphuretted Hydrogen | HS | 1.51991 | 3.03982 | 4.55973 |
| Selenium | Se | 7.02556 | 14.05112 | 21.07668 |
| Selenuretted Hydrogen | HSe | 3.60239 | 7.20478 | 10.80717 |
| Nitrogen | N | 1.25618 | 2.51236 | 3.76854 |
| Deutoxide of Nitrogen | $NO_2$ | 1.34343 | 2.68686 | 4.03029 |
| Protoxide of Nitrogen | NO | 1.97172 | 3.94344 | 5.91516 |
| Tellurium | Te | 11.53525 | 23.07050 | 34.60575 |
| Telluretted Hydrogen | HTe | 5.85723 | 11.71446 | 17.57169 |
| Water Vapor | HO | 0.80475 | 1.60950 | 2.41425 |
| Hydrogen | H | 0.08958 | 0.17916 | 0.26874 |
| Atmospheric Air | | 1.29319 | 2.58638 | 3.87957 |

## ESTIMATION OF THE VOLUME OF OXYGEN

| Volume of Air. | 100.00. | 200.00. | 300.00. |
|---|---|---|---|
| Volume of Nitrogen | 79.04 | 158.08 | 237.12 |
| Volume of Oxygen | 20.96 | 41.92 | 62.88 |

| 4000 cc. | 5000 cc. | 6000 cc. | 7000 cc. | 8000 cc. | 9000 cc. |
|---|---|---|---|---|---|
| Grammes. | Grammes. | Grammes. | Grammes. | Grammes. | Grammes. |
| 1.71921 | 7.14901 | 8.57881 | 10.00861 | 11.41842 | 12.86822 |
| 68.65344 | 85.81680 | 102.98016 | 120.14352 | 137.30688 | 154.47024 |
| 11.44224 | 14.30280 | 17.16336 | 20.02392 | 22.88448 | 25.74504 |
| 6.07964 | 7.59955 | 9.11946 | 10.63937 | 12.15928 | 13.67919 |
| 28.10224 | 35.12780 | 42.15336 | 49.17892 | 56.20448 | 63.23004 |
| 14.40956 | 18.01195 | 21.61434 | 25.21673 | 28.81912 | 32.42151 |
| 5.02572 | 6.28090 | 7.53708 | 8.79326 | 10.04944 | 11.30562 |
| 5.37372 | 6.71615 | 8.06058 | 9.40301 | 10.74744 | 12.09087 |
| 7.88688 | 9.85860 | 11.83032 | 13.80204 | 15.77376 | 17.74548 |
| 46.14100 | 57.67625 | 69.21150 | 80.74675 | 92.28200 | 103.81725 |
| 23.42892 | 29.28615 | 35.14338 | 41.00061 | 46.85784 | 52.71507 |
| 3.21900 | 4.02375 | 4.82850 | 5.63325 | 6.43800 | 7.24275 |
| 0.35832 | 0.44790 | 0.53748 | 0.62706 | 0.71664 | 0.80622 |
| 5.17276 | 6.46595 | 7.75914 | 9.05233 | 10.34562 | 11.63871 |

AND NITROGEN IN ATMOSPHERIC AIR.

| 400 00. | 500.00. | 600.00. | 700.00. | 800.00. | 900.00. |
|---|---|---|---|---|---|
| 316.16 | 395.20 | 474.24 | 553.28 | 632.32 | 711.36 |
| 83.84 | 104.80 | 125.76 | 146.72 | 167.68 | 188.64 |

# TABLES

# RELATING TO LIGHT.

# FORMULAS.

If $d$ represent the density and $n$ the index of refraction of a liquid for a given ray of light, the quantity

$$\frac{n-1}{d}$$

is found to be constant, and is termed the specific refractive power. The relation between the specific refractive power of a mixture and the specific refractive powers of its constituents is given by the equation,

$$\frac{N-1}{D} \cdot P = \frac{n-1}{d} \cdot p + \frac{n'-1}{d'} \cdot p' + \frac{n''-1}{d''} \cdot p'' + \ldots\ldots$$

where, $p$, $p'$, $p''$, &c. represent the weights of the constituents in $P$ units of weight of the mixture.

Hence, if the specific refractive power of a mixture be determined at any temperature from its index of refraction and density, and if the corresponding values are known for each constituent, the relative weights of the latter may easily be calculated when only two are present.

If $P$ be taken as 100 we have

$$\frac{n-1}{d} \cdot p + \frac{n'-1}{d'} (100 - p) = \frac{N-1}{D} \cdot 100,$$

whence,

$$p = \frac{100 \left( \frac{N-1}{D} - \frac{n'-1}{d'} \right)}{\frac{n-1}{d} - \frac{n'-1}{d'}},$$

$$p' = 100 - p.$$

# TABLE

## OF WAVE LENGTHS IN MILLIONTHS OF MILLIMETRES.

*Those marked * are Ångström's measurements.*

DITSCHEINER. — Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften, Bd. L. Heft III. Jahrgang, 1864. Corrected according to the Wave Length of D$\alpha$ given by Ångström. (Pogg. Ann. CXXIII. s. 489.)

| Kirchhoff's Line. | Wave Length. | Kirchhoff's Line. | Wave Length | Kirchhoff's Line. | Wave Length | Kirchhoff's Line. | Wave Length. |
|---|---|---|---|---|---|---|---|
| A | *761.20 | 1242.6 | 557.77 | 1737.7 | 511.42 | 2221.7 | 474.34 |
| B 592.7 | *687.49 | 1280.0 | 553.27 | 1750.4 | 510.30 | 2233.7 | 473.36 |
| C 694.1 | *656.77 | 1303.5 | 551.13 | 1777.5 | 508.41 | 2250.0 | 472.26 |
| 711.4 | 652.09 | 1306.7 | 550.70 | 1799.0 | 506.91 | 2264.3 | 470.71 |
| 719.6 | 650.05 | 1324.8 | 548.13 | 1834.3 | 504.55 | 2309.0 | 467.07 |
| 783.8 | 634.05 | 1337.0 | 546.78 | 1854.9 | 503.25 | 2416.0 | 460.63 |
| 831.0 | 623.61 | 1343.5 | 546.05 | 1867.1 | 502.26 | 2436.5 | 458.66 |
| 849.7 | 619.72 | 1351.1 | 545.08 | 1873.4 | 501.67 | 2457.5 | 456.81 |
| 860.2 | 617.50 | 1367.0 | 543.42 | 1885.8 | 501.07 | 2467.6 | 455.71 |
| 863.9 | 616.73 | 1389.4 | 540.91 | 1908.5 | 499.72 | 2489.4 | 453.73 |
| 874.3 | 614.74 | 1410.5 | 538.79 | 1920.2 | 498.78 | 2537.1 | 450.56 |
| 877.0 | 614.24 | 1421.5 | 537.52 | 1960.8 | 496.15 | 2547.2 | 450.13 |
| 884.9 | 612.76 | 1449.4 | 534.41 | 1975.7 | 495.04 | 2566.3 | 448.46 |
| 894.9 | 610.82 | 1463.3 | 533.29 | 1983.3 | 494.34 | 2606.6 | 446.00 |
| 959.8 | 598.14 | 1492.4 | 530.22 | 1989.5 | 493.76 | 2627.0 | 444.65 |
| D$\beta$ 1002.8 | *590.04 | 1506.3 | 528.79 | 2001.6 | 492.22 | 2638.5 | 443.85 |
| D$\gamma$ 1004.8 | *589.74 | 1515.5 | 528.02 | 2018.5 | 491.41 | 2670.0 | 442.29 |
| D$\alpha$ 1006.8 | *589.43 | E 1523.7 | *527.38 | 2041.3 | 489.54 | 2686.6 | 440.87 |
| 1029.3 | 586.26 | 1541.9 | 525.98 | 2058.0 | 488.18 | 2721.6 | 438.75 |
| 1096.1 | 576.72 | 1569.6 | 523.74 | 2067.1 | 487.55 | 2734.1 | 437.80 |
| 1102.9 | 575.78 | 1577.6 | 523.09 | F 2080.0 | *486.52 | 2775.7 | 435.67 |
| 1135.1 | 571.51 | 1589.1 | 521.97 | 2103.3 | 484.63 | 2796.7 | 434.34 |
| 1155.7 | 568.70 | 1601.7 | 521.32 | 2119.8 | 482.81 | 2822.3 | 432.82 |
| 1174.2 | 566.33 | 1622.3 | 519.67 | 2148.9 | 480.56 | G 2854.7 | *431.03 |
| 1200.6 | 562.97 | 1634.1 | 518.73 | 2157.4 | 479.55 | 2869.7 | 430.37 |
| 1207.3 | 561.98 | b 1648.8 | 517.70 | 2160.6 | 479.23 | H | *397.16 |
| 1217.8 | 560.77 | 1655.6 | 517.15 | 2187.1 | 476.93 | H' | *393.59 |
| 1237.8 | 559.13 | 1693.8 | 514.65 | 2201.9 | 475.90 | | |

# TABLE

## OF WAVE LENGTHS OF VARIOUS WELL-MARKED LINES OF THE SPECTRUM IN MILLIONTHS OF A MILLIMETRE.

W. GIBBS. — American Jour. of Science, XXXIX. 217.

| Line. | Wave Length. | Observer. | Line. | Wave Length. | Observer. |
|---|---|---|---|---|---|
| $\alpha$ L | 676.3 | Müller | $\epsilon$ I | 516.7 | Plücker |
| $\beta$ N | 661.0 | " | $\gamma$ $SiCl_2$ | 505.0 | " |
| $\alpha$ H | 653.3 | Plücker | $\beta$ H | 484.3 | " |
| $\alpha$ $PCl_2$ | 649.3 | " | $\beta$ Br | 479.3 | " |
| $\alpha$ $SnCl_2$ | 644.5 | " | $\gamma$ Cl | 479.2 | " |
| $\alpha$ $SiCl_2$ | 632.9 | " | $\gamma$ Br | 476.6 | " |
| $\alpha$ O | 615.0 | " | $\delta$ Br | 469.1 | " |
| 11 N | 608.9 | " | $\zeta$ I | 466.1 | " |
| $\beta$ $PCl_2$ | 602.4 | " | $\delta$ $S_2$ | 463.1 | Müller |
| $\beta$ $SiCl_2$ | 597.8 | " | $\eta$ I | 462.9 | Plücker |
| $\beta$ I | 594.7 | " | $\gamma$ $PCl_3$ | 459.1 | " |
| $\beta$ $SnCl_2$ | 579.4 | " | $\epsilon$ $SnCl_2$ | 452.4 | " |
| $\alpha$ Hg | 578.2 | " | $\zeta$ $CO_2$ | 450.1 | " |
| 17 N | 576.2 | " | $\theta$ I | 444.6 | " |
| $\alpha'$ Hg | 575.9 | " | $\eta$ $CO_2$ | 438.2 | " |
| $\gamma$ $CO_2$ | 559.9 | " | $\delta$ O | 436.7 | " |
| $\gamma$ $SnCl_2$ | 558.4 | " | $\gamma$ Hg | 435.9 | " |
| $\beta$ Hg | 546.1 | " | $\gamma$ H | 433.9 | " |
| $\alpha$ Cl | 545.1 | " | $\iota$ I | 421.5 | " |
| $\delta$ I | 533.7 | " | L | 379.1 | Esselbach |
| $\delta$ $SnCl_2$ | 533.3 | " | M | 365.7 | " |
| $\beta$ O | 532.8 | " | N | 349.8 | " |
| $\beta$ Cl | 521.6 | " | O | 336.0 | " |
| $\delta$ $CO_2$ | 519.0 | " | P | 329.0 | " |
| $\gamma$ O | 518.5 | " | Q | 323.2 | " |
| $\alpha$ Br | 516.9 | " | R | 309.1 | " |

## INDICES OF

OF SOME OF THE MOST

$\Delta$ = *The diminution in refraction for*

LANDOLT. — Pogg. Ann., Bd.

| Compounds. | Formula. | Combining Number. $P.$ | Specific Gravity. $d.$ | $\mu_a$ |
|---|---|---|---|---|
| Water | HO | 9 | 1.0000 | 1.331110 |
| $\Delta$ | | | | 0.000096 |
| Formic Acid | $C_2H_2O_4$ | 46 | 1.2211 | 1.369270 |
| $\Delta$ | | | | 0.000395 |
| Acetic Acid | $C_4H_4O_4$ | 60 | 1.0514 | 1.369850 |
| $\Delta$ | | | | 0.000418 |
| Propionic Acid | $C_6H_6O_4$ | 74 | 0.9963 | 1.384600 |
| $\Delta$ | | | | 0.000399 |
| Butyric Acid | $C_8H_8O_4$ | 88 | 0.9610 | 1.395540 |
| $\Delta$ | | | | 0.000412 |
| Valeric Acid | $C_{10}H_{10}O_4$ | 102 | 0.9313 | 1.402200 |
| $\Delta$ | | | | 0.000406 |
| Capronic Acid | $C_{12}H_{12}O_4$ | 116 | 0.9252 | 1.411640 |
| $\Delta$ | | | | 0.000396 |
| Œnanthic Acid | $C_{14}H_{14}O_4$ | 130 | 0.9175 | 1.419230 |
| $\Delta$ | | | | 0.000391 |
| Methyl Alcohol | $C_2H_4O_2$ | 32 | 0.7964 | 1.327890 |
| $\Delta$ | | | | 0.000380 |
| Ethyl Alcohol | $C_4H_6O_2$ | 46 | 0.8011 | 1.360540 |
| $\Delta$ | | | | 0.000400 |
| Propyl Alcohol | $C_6H_8O_2$ | 60 | 0.8042 | 1.379380 |
| Butyl Alcohol | $C_8H_{10}O_2$ | 74 | 0.8074 | 1.393950 |
| $\Delta$ | | | | 0.000390 |
| Amyl Alcohol | $C_{10}H_{12}O_2$ | 88 | 0.8135 | 1.405730 |
| $\Delta$ | | | | 0.000390 |
| Acetate of Methyl | $C_6H_6O_4$ | 74 | 0.9053 | 1.359150 |
| $\Delta$ | | | | 0.000520 |
| Formate of Ethyl | $C_6H_6O_4$ | 74 | 0.9078 | 1.358000 |
| $\Delta$ | | | | 0.000530 |
| Acetate of Ethyl | $C_8H_8O_4$ | 88 | 0.9021 | 1.370680 |
| $\Delta$ | | | | 0.000500 |
| Butyrate of Methyl | $C_{10}H_{10}O_4$ | 102 | 0.8976 | 1.386930 |
| $\Delta$ | | | | 0.000490 |

# REFRACTION

## COMMON ORGANIC COMPOUNDS.

*an elevation of temperature of one degree.*

117, S. 353, Bd. 122, S. 545.

| $\mu_\beta$ | $\mu_\gamma$ | $A$ | $B$ | $\frac{\mu_\alpha - 1}{d}$ | $P\left(\frac{\mu_\alpha - 1}{d}\right)$ |
|---|---|---|---|---|---|
| 1.337120 | 1.340380 | 1.323920 | 0.30997 | 0.3311 | 5.96 |
| 0.000108 | 0.000110 | | | | |
| 1.376480 | 1.380410 | 1.360620 | 0.37250 | 0.3024 | 13.91 |
| 0.000400 | 0.000433 | 0.000368 | | | |
| 1.376480 | 1.380170 | 1.361840 | 0.34588 | 0.3518 | 21.11 |
| 0.000408 | 0.000430 | 0.000409 | | | |
| 1.391290 | 1.395130 | 1.376430 | 0.35210 | 0.3860 | 28.57 |
| 0.000402 | 0.000402 | 0.000397 | | | |
| 1.402460 | 1.406490 | 1.387040 | 0.36614 | 0.4116 | 36.22 |
| 0.000419 | 0.000429 | 0.000398 | | | |
| 1.409310 | 1.413490 | 1.393440 | 0.37751 | 0.4319 | 44.05 |
| 0.000420 | 0.000428 | 0.000393 | | | |
| 1.419000 | 1.423230 | 1.402640 | 0.38754 | 0.4449 | 51.61 |
| 0.000409 | 0.000413 | 0.000380 | | | |
| 1.426630 | 1.431060 | 1.410050 | 0.39557 | 0.4569 | 59.40 |
| 0.000411 | 0.000410 | 0.000375 | | | |
| 1.333200 | 1.336210 | 1.321430 | 0.27821 | 0.4117 | 13.17 |
| 0.000400 | 0.000400 | | | | |
| 1.366650 | 1.369970 | 1.353220 | 0.31532 | 0.4501 | 20.70 |
| 0.000410 | 0.000410 | | | | |
| 1.385810 | 1.389320 | 1.371670 | 0.33238 | 0.4717 | 28.30 |
| 1.400690 | 1.404470 | 1.385790 | 0.35177 | 0.4879 | 36.11 |
| 0.000410 | 0.000410 | | | | |
| 1.412780 | 1.416890 | 1.397070 | 0.37317 | 0.4987 | 43.89 |
| 0.000400 | 0.000420 | | | | |
| 1.365390 | 1.368930 | 1.351560 | 0.32702 | 0.3967 | 29.36 |
| 0.000520 | 0.000530 | | | | |
| 1.364200 | 1.367820 | 1.350380 | 0.32836 | 0.3944 | 29.18 |
| 0.000550 | 0.000570 | | | | |
| 1.377090 | 1.380670 | 1.362930 | 0.33405 | 0.4109 | 36.16 |
| 0.000520 | 0.000540 | | | | |
| 1.393590 | 1.397420 | 1.378790 | 0.35077 | 0.4311 | 43.97 |
| 0.000510 | 0.000520 | | | | |

| Compounds. | Formula. | Combining Number. $P.$ | Specific Gravity. $d.$ | $\mu_\alpha$ |
|---|---|---|---|---|
| Valerate of Methyl | $C_{12}H_{12}O_4$ | 116 | 0.8809 | 1.392720 |
| Δ | | | | 0.000460 |
| Butyrate of Ethyl | $C_{12}H_{12}O_4$ | 116 | 0.8906 | 1.394040 |
| Δ | | | | 0.000480 |
| Formate of Amyl | $C_{12}H_{12}O_4$ | 116 | 0.8816 | 1.395920 |
| Δ | | | | 0.000480 |
| Valerate of Ethyl | $C_{14}H_{14}O_4$ | 130 | 0.8674 | 1.395000 |
| Δ | | | | 0.000470 |
| Acetate of Amyl | $C_{14}H_{14}O_4$ | 130 | 0.8574 | 1.401680 |
| Δ | | | | 0.000430 |
| Valerate of Amyl | $C_{20}H_{20}O_4$ | 172 | 0.8581 | 1.409780 |
| Aldehyde | $C_4H_4O_2$ | 44 | 0.7810 | 1.329750 |
| Δ | | | | 0.000580 |
| Valeral | $C_{10}H_{10}O_2$ | 86 | 0.7995 | 1.386140 |
| Δ | | | | 0.000470 |
| Aceton | $C_6H_6O_2$ | 58 | 0.7931 | 1.357150 |
| Δ | | | | 0.000520 |
| Ether | $C_8H_{10}O_2$ | 74 | 0.7166 | 1.351120 |
| Δ | | | | 0.000580 |
| Anhydrous Acetic Acid | $C_6H_6O_6$ | 102 | 1.0836 | 1.388320 |
| Δ | | | | 0.000460 |
| Glycol | $C_4H_6O_4$ | 62 | 1.1092 | 1.425300 |
| Δ | | | | 0.000280 |
| Binacetate of Glycol | $C_{12}H_{10}O_8$ | 146 | 1.1583 | 1.419320 |
| Glycerin | $C_6H_8O_6$ | 92 | 1.2615 | 1.470630 |
| Δ | | | | 0.000200 |
| Lactic Acid | $C_6H_6O_6$ | 90 | 1.2427 | 1.439150 |
| Δ | | | | 0.000370 |
| Phenic Acid | $C_{12}H_6O_2$ | 94 | 1.0722 | 1.544470 |
| Δ | | | | 0.000420 |
| Bitter Almond Oil | $C_{14}H_6O_2$ | 106 | 1.0474 | 1.539140 |
| Δ | | | | 0.000500 |
| Salicylous Acid | $C_{14}H_6O_4$ | 122 | 1.1693 | 1.564670 |
| Δ | | | | 0.000490 |
| Methylsalicylic Acid | $C_{16}H_8O_6$ | 152 | 1.1824 | 1.530190 |
| Δ | | | | 0.000440 |
| Benzoate of Methyl | $C_{16}H_8O_4$ | 136 | 1.0882 | 1.511580 |
| Δ | | | | 0.000450 |
| Benzoate of Ethyl | $C_{16}H_{10}O_4$ | 150 | 1.0491 | 1.501040 |
| Δ | | | | 0.000460 |

$\mu_\alpha$, $\mu_\beta$, $\mu_\gamma$ = the Indices of Refraction for the three Hydrogen lines, $H\alpha$, $H\beta$, and $H\gamma$.

| $\mu_\beta$ | $\mu_\gamma$ | $A$ | $B$ | $\frac{\mu_\alpha - 1}{d}$ | $P\left(\frac{\mu_\alpha - 1}{d}\right)$ |
|---|---|---|---|---|---|
| 1.399690 | 1.403700 | 1.384200 | 0.36715 | 0.4458 | 51.71 |
| 0.000470 | 0.000480 | | | | |
| 1.400730 | 1.404600 | 1.385800 | 0.35310 | 0.4424 | 51.32 |
| 0.000490 | 0.000500 | | | | |
| 1.402690 | 1.406890 | 1.387410 | 0.36682 | 0.4491 | 52.09 |
| 0.000500 | 0.000510 | | | | |
| 1.401870 | 1.405830 | 1.386590 | 0.36214 | 0.4554 | 59.20 |
| 0.000480 | 0.000490 | | | | |
| 1.408760 | 1.412710 | 1.393120 | 0.36882 | 0.4685 | 60.90 |
| 0.000430 | 0.000440 | | | | |
| 1.417120 | 1.421240 | 1.400890 | 0.38320 | 0.4775 | 82.14 |
| 1.335880 | 1.339370 | 1.322290 | 0.32161 | 0.4222 | 18.58 |
| 0.000610 | 0.000620 | | | | |
| 1.393360 | 1.397290 | 1.377490 | 0.37283 | 0.4830 | 41.54 |
| 0.000500 | 0.000520 | | | | |
| 1.363920 | 1.367800 | 1.348880 | 0.35612 | 0.4503 | 26.12 |
| 0.000540 | 0.000550 | | | | |
| 1.357200 | 1.360710 | 1.343680 | 0.32067 | 0.4900 | 36.26 |
| 0.000590 | 0.000590 | | | | |
| 1.395250 | 1.399270 | 1.379820 | 0.36614 | 0.3584 | 36.56 |
| 0.000470 | 0.000490 | | | | |
| 1.432510 | 1.436620 | 1.416510 | 0.37832 | 0.3834 | 23.77 |
| 0.000320 | 0.000370 | | | | |
| 1.426810 | 1.431200 | 1.410100 | 0.39725 | 0.3620 | 52.85 |
| 1.478450 | 1.482810 | 1.461180 | 0.40728 | 0.3731 | 34.32 |
| 0.000220 | 0.000240 | | | | |
| 1.446860 | 1.451350 | 1.429680 | 0.40794 | 0.3534 | 31.81 |
| 0.000380 | 0.000380 | | | | |
| 1.563570 | 1.575550 | 1.520350 | 1.03925 | 0.5078 | 47.73 |
| 0.000440 | 0.000470 | | | | |
| 1.562350 | 1.577490 | 1.509400 | 1.28201 | 0.5147 | 54.56 |
| 0.000510 | 0.000540 | | | | |
| 1.596000 | 1.620080 | 1.521670 | 1.85280 | 0.4829 | 58.91 |
| 0.000520 | 0.000540 | | | | |
| 1.552120 | 1.567180 | 1.501480 | 1.23687 | 0.4484 | 68.16 |
| 0.000460 | 0.000510 | | | | |
| 1.528900 | 1.539890 | 1.489610 | 0.94663 | 0.4701 | 63.94 |
| 0.000490 | 0.000500 | | | | |
| 1.517150 | 1.527490 | 1.480510 | 0.88444 | 0.4776 | 71.64 |
| 0.000510 | 0.000550 | | | | |

$A$ = Coefficient of Refraction.

$B$ = Coefficient of Dispersion in Couchy's formula

$$\mu = A + \frac{B}{\lambda^2}.$$

# TABLE

## OF INDICES OF REFRACTION OF ESSENTIAL OILS.

GLADSTONE. — Journal of the Chemical Society of London, N. S. Vol. II. p. 1.

| Crude Oils. | Specific Gravity 15.5 °C. | Refractive Indices. | | | | Rotation. |
|---|---|---|---|---|---|---|
| | | Temp. | *A* | *D* | *H* | |
| | | ° | | | | ° |
| Anise | 0.9852 | 16.5 | 1.5433 | 1.5566 | 1.6118 | — 1.0 |
| Antherosperma Moschatum | 1.0425 | 14.0 | 1.5172 | 1.5274 | 1.5628 | + 7.0 |
| Bay | 0.8808 | 18.5 | 1.4944 | 1.5022 | 1.5420 | — 6.0 |
| Bergamot | 0.8825 | 22.0 | 1.4559 | 1.4625 | 1.4779G | + 23.0 |
| " Florence | 0.8804 | 26.5 | 1.4547 | 1.4614 | 1.4760G | + 40.0 |
| Birch Bark | 0.9005 | 8.0 | 1.4851 | 1.4921 | 1.5172 | + 38.0 |
| Cajeput | 0.9203 | 25.5 | 1.4561 | 1.4611 | 1.4778 | 0.0 |
| Calamus | 0.9388 | 10.0 | 1.4965 | 1.5031 | 1.5204G | + 43.5 |
| " Hamburg | 0.9410 | 11.0 | 1.4843 | 1.4911 | 1.5144 | +42.0? |
| Caraway | 0.8845 | 19.0 | 1.4601 | 1.4671 | 1.4886 | + 63.0 |
| " Hamburg 1st dist. | 0.9121 | 10.0 | 1.4829 | 1.4903 | 1.5142 | |
| " " 2d " | 0.8832 | 10.5 | | 1.4784 | | |
| Cascarilla | 0.8956 | 10.0 | 1.4844 | 1.4918 | 1.5158 | + 26.0 |
| Cassia | 1.0297 | 19.5 | 1.5602 | 1.5748 | 1.6243G | 0.0 |
| Cedar | 0.9622 | 23.0 | 1.4978 | 1.5035 | 1.5238 | + 3.0 |
| Cedrat | 0.8584 | 18.0 | 1.4671 | 1.4731 | 1.4952 | +156.0 |
| Citronella | 0.8908 | 21.0 | 1.4599 | 1.4659 | 1.4866 | — 4.0 |
| " Penang | 0.8847 | 15.5 | 1.4604 | 1.4665 | 1.4875 | — 1.0 |
| Cloves | 1.0475 | 17.0 | 1.5213 | 1.5312 | 1.5666 | — 4.0 |
| Coriander | 0.8775 | 10.0 | 1.4592 | 1.4652 | 1.4805G | +21.0? |
| Cubebs | 0.9414 | 10.0 | 1.4953 | 1.5011 | 1.5160G | |
| Dill | 0.8922 | 11.5 | 1.4764 | 1.4834 | 1.5072 | +206.0 |
| Elder | 0.8584 | 8.5 | 1.4686 | 1.4749 | 1.4965 | + 14.5 |
| Eucalyptus amygdalina | 0.8812 | 13.5 | 1.4717 | 1.4788 | 1.5021 | —136.0 |
| " oleosa | 0.9322 | 13.5 | 1.4661 | 1.4718 | 1.4909 | + 4.0 |
| Indian Geranium | 0.9043 | 21.5 | 1.4653 | 1.4714 | 1.4868G | — 4.0 |
| Lavender | 0.8903 | 20.0 | 1.4586 | 1.4648 | 1.4862 | — 20.0 |
| Lemon-grass | 0.8932 | 24.0 | | 1.4705 | | — 3.0? |
| " Penang | 0.8766 | 13.5 | 1.4756 | 1.4837 | 1.5042 | 0.0 |
| Malaleuca ericifolia | 0.9030 | 9.0 | 1.4655 | 1.4712 | 1.4901 | + 26.0 |
| " linarifolia | 0.9016 | 9.0 | 1.4710 | 1.4772 | 1.4971 | + 11.0 |
| Mint | 0.9342 | 19.0 | 1.4767 | 1.4840 | 1.5015G | —116.0 |
| " | 0.9105 | 14.5 | 1.4756 | 1.4822 | 1.5037 | — 13.0 |

| Crude Oils. | Specific Gravity 15.5 °C. | Refractive Indices. | | | | Rotation. |
|---|---|---|---|---|---|---|
| | | Temp. | *A* | *D* | *H* | |
| | | ° | | | | ° |
| Myrtle | 0.8911 | 14.0 | 1.4623 | 1.4680 | 1.4879 | + 21.0 |
| Myrrh | 1.0189 | 7.5 | 1.5196 | 1.5278 | 1.5472G | —136.0 |
| Neroli | 0.8789 | 18.0 | 1.4614 | 1.4676 | 1.4835G | + 15.0 |
| " | 0.8743 | 10.0 | 1.4673 | 1.4741 | 1.4831F | + 28.0 |
| Nutmeg | 0.8826 | 24.0 | 1.4644 | 1.4709 | 1.4934 | + 44.0 |
| " Penang | 0.9069 | 16.0 | 1.4749 | 1.4818 | 1.5053 | + 9.0 |
| Orange-peel | 0.8509 | 20.0 | 1.4633 | 1.4699 | 1.4916 | +32.0? |
| " Florence | 0.8864 | 20.0 | 1.4707 | 1.4774 | 1.4980 | +216.0 |
| Parsley | 0.9926 | 8.5 | 1.5068 | 1.5162 | 1.5417G | — 9.0 |
| Patchouli | 0.9554 | 21.0 | 1.4990 | 1.5050 | 1.5194G | |
| " Penang | 0.9592 | 21.0 | 1.4980 | 1.5040 | 1.5183G | —120.0 |
| " French | 1.0119 | 14.0 | 1.5074 | 1.5132 | 1.5202F | |
| Peppermint | 0.9028 | 14.5 | 1.4612 | 1.4670 | 1.4854 | — 72.0 |
| " Florence | 0.9116 | 14.0 | 1.4628 | 1.4682 | 1.4867 | — 44.0 |
| Petit Grain | 0.8765 | 21.0 | 1.4536 | 1.4600 | 1.4808 | + 26.0 |
| Rose | 0.8912 | 25.0 | 1.4567 | 1.4627 | 1.4835 | — 7.0 |
| Rosemary | 0.9080 | 16.5 | 1.4632 | 1.4688 | 1.4867 | + 17.0 |
| Rosewood | 0.9064 | 17.0 | 1.4843 | 1.4903 | 1.5118 | — 16.0 |
| Sandalwood | 0.9750 | 24.0 | 1.4959 | 1.5021 | 1.5227 | — 50.0 |
| Thyme | 0.8843 | 19.0 | 1.4695 | 1.4754 | 1.4909G | |
| Turpentine | 0.8727 | 13.0 | 1.4672 | 1.4732 | 1.4938 | — 79.0 |
| Verbena | 0.8812 | 20.0 | 1.4791 | 1.4870 | 1.5059G | — 6.0 |
| Wintergreen | 1.1423 | 15.0 | 1.5163 | 1.5278 | 1.5737 | + 3.0 |
| Wormwood | 0.9122 | 18.0 | 1.4631 | 1.4688 | 1.4756F | |

NOTE. — The tube by which the Angle of Rotation was determined was ten inches long. The numbers marked G and F are the indices of refraction for the lines G and F, the color of the liquid preventing H from being seen.

# TABLE

## OF THE PHYSICAL PROPERTIES OF THE HYDROCARBONS OF THE ESSENTIAL OILS.

GLADSTONE. — Journal of the Chemical Society of London, 2d Series, Vol. II. p. 1.

| Source of Hydrocarbon. | Sp. Gr. at 20° C. = $D$ | Boiling Point. | Index of Refraction of $A$ at 20° C. $\mu A =$ | Dispersion. $A$ to $H$ | $\Delta 10°$ | $\frac{\mu A - 1}{D}$ | Rotation. |
|---|---|---|---|---|---|---|---|
| | | ° | | | | | ° |
| Orange peel | .8460 | 174 | 1.4645 | .0277 | .0048 | .5490 | +154 |
| " " Florence | .8468 | 174 | 1.4650 | .0281 | .0049 | .5491 | +260 |
| Cedrat | .8466 | 173 | 1.4650 | .0280 | .0049 | .5492 | +180 |
| Lemon | .8468 | 173 | 1.4660 | .0280 | 0049 | .5502 | +172 |
| Bergamot | .8466 | 175 | 1.4619 | .0295 | .0049 | .5456 | + 76 |
| " Florence | .8464 | 176 | 1.4602 | .0287 | .0048 | .5437 | + 82 |
| Neroli | .8466 | 173 | 1.4614 | .0291 | .0047 | .5450 | + 76 |
| Petit Grain | .8470 | 174 | 1.4617 | .0282 | .0046 | .5439 | + 60 |
| Caraway Hamburg 1st dist. | .8466 | 176 | 1.4645 | .0286 | .0048 | .5486 | +180 |
| Dill | .8467 | 173 | 1.4646 | .0288 | .0046 | .5486 | +242 |
| Cascarilla | .8467 | 172 | 1.4652 | .0305 | .0049 | .5494 | 0 |
| Elder | .8468 | 172 | 1.4631 | .0269 | .0047 | .5468 | + 15 |
| Bay | .8508 | 171 | 1.4542 | .0260 | .0047 | .5338 | — 22 |
| Gaultherilene | .8510 | 168 | 1.4614 | .0271 | .0049 | .5422 | |
| Nutmeg | .8518 | 167 | 1.4630 | .0284 | .0047 | .5435 | + 49 |
| " Penang | .8527 | 166 | 1.4634 | .0274 | .0049 | .5434 | + 4 |
| Carvene | .8530 | 166 | 1.4610 | .0261 | .0048 | .5440 | — 20 |
| " Hamburg 2d dist. | .8545 | | 1.4641 | .0263 | .0048 | .5431 | + 86 |
| Wormwood | .8565 | 160 | 1.4590 | .0253 | .0047 | .5359 | + 46 |
| Terebene | .8583 | 160 | 1.4670 | .0275 | .0048 | .5440 | 0 |
| Anise | .8580 | 160 | 1.4607 | .0268 | .0047 | .5368 | |
| Mint | .8600 | 160 | 1.4622 | .0255 | .0048 | .5374 | + 30 |
| Peppermint | .8602 | 175 | 1.4577 | .0267 | .0047 | .5321 | — 60 |
| Laurel Turpentine | .8618 | 160 | 1.4637 | .0260 | .0047 | .5380 | + 94 |
| Thyme | .8635 | 160 | 1.4617 | .0282 | .0048 | .5346 | — 75 |
| Turpentine I. | .8644 | 160 | 1.4612 | .0250 | .0047 | .5335 | + 48 |
| " II. | .8555 | 160 | 1.4590 | .0256 | .0047 | .5365 | — 87 |
| " III. | .8614 | 160 | 1.4621 | .0249 | | .5364 | — 90 |
| " IV. | .8600 | 160 | 1.4613 | .0254 | .0047 | .5364 | — 88 |
| Eucalyptus amygdalina | .8642 | 171 | 1.4696 | .0323 | .0049 | .5434 | —142 |

| Source of Hydrocarbon. | Sp. Gr. at 20° C. = $D$ | Boiling Point. | Index of Refraction of $A$ at 20° C. $\mu A$ = | Dispersion, $A$ to $H$ | $\Delta 10°$ | $\frac{\mu A - 1}{D}$ | Rotation. |
|---|---|---|---|---|---|---|---|
| Myrtle | .8690 | 163° | 1.4565 | .0248 | .0047 | .5253 | + 64° |
| Parsley | .8732 | 160 | 1.4665 | .0291 | .0046 | .5355 | — 44 |
| Rosemary | .8805 | 163 | 1.4583 | .0241 | .0046 | .5205 | + 8 |
| Cloves | .9041 | 249 | 1.4898 | .0284 | .0045 | .5417 | |
| Rosewood | .9042 | 249 | 1.4878 | .0277 | .0045 | .5395 | — 11 |
| Cubebs | .9062 | 260 | 1.4950 | .0302 | .0041 | .5462 | + 59 |
| Calamus | .9180 | 260 | 1.4930 | .0322 | .0042 | .5370 | + 55 |
| " Hamburg | .9275 | 260 | 1.4976 | .0337 | .0043 | .5365 | + 22 |
| Cascarilla | .9212 | 254 | 1.4926 | .0307 | .0042 | .5347 | + 72 |
| Patchouli | .9211 | 254 | 1.4966 | .0274 | .0042 | .5391 | |
| " Penang | .9278 | 257 | 1.4963 | .0275 | .0044 | .5349 | — 90 |
| " French | .9255 | 260 | 1.5009 | .0262 | .0042 | .5412 | |
| Colophene | .9391 | 315 | 1.5084 | .0309 | .0041 | .5413 | 0 |

# MISCELLANEOUS.

## SOLUBILITIES OF SOME OF THE MORE COMMON PRECIPITATES.

FRESENIUS. — Quan. Analysis, pp. 740-749.

**Bichloride of Potassium and Platinum.** — In absence of free Hydrochloric acid one part of the salt dissolves in 12083 parts of alcohol of 97.5 per cent, in 3775, of 76 per cent, and in 1053, of 55 per cent. In presence of free Hydrochloric acid, in 1835, of 76 per cent.

**Bichloride of Ammonium and Platinum.** — In absence of free Hydrochloric acid, one part of the salt dissolves in 26535 parts of alcohol of 97.5 per cent, in 1406 parts of alcohol of 76 per cent, in 665 parts of alcohol of 55 per cent. In presence of free Hydrochloric acid, one part of the salt requires 672 parts of spirit of 76 per cent.

**Carbonate of Barium.** — One part dissolves in 14137 parts of water at 15-20°. One part dissolves in 15432 parts of boiling water. One part dissolves in 141000 parts of water containing Ammonia, Carbonate of Ammonium, and Chloride of Ammonium.

**Fluosilicate of Barium.** — One part of the salt requires 3802 parts of cold, or 3392 parts of boiling water for solution. One part of the salt requires from 640 to 733 parts of water acidified with Hydrochloric for solution.

**Sulphate of Strontium.** — One part of the salt dissolves in 6895 parts of water at 14°, in 9638 parts of boiling water, in 11862 parts of water containing Sulphuric and Hydrochloric acids, in 432 parts of Nitric acid of 4.8 per cent, in 474 parts of Hydrochloric of 8.5 per cent, and in 7843 parts of Acetic acid of 15.6 per cent.

**Carbonate of Strontium.** — One part of the salt requires 18045 parts of cold water for solution, and 56545 parts of a solution containing Carbonate of Ammonium and free Ammonia.

**Carbonate of Calcium.** — One part dissolves in 8834 parts of boiling, or in 10601 parts of cold water. One part requires 65246 parts of a solution of Carbonate of Ammonium and free Ammonia to dissolve it.

**Basic Phosphate of Magnesium and Ammonium.** — One part dissolves in 15293 parts of pure water, in 44600 parts of water containing free Ammonia, in 7548 parts of water containing Chloride of Ammonium, and in 15627 parts of water containing Chloride of Ammonium and Ammonia.

**Magnesia.** — One part dissolves in 55368 parts of water.

**Basic Carbonate of Zinc.** — One part dissolves in 44642 parts of water.

**Carbonate of Lead.** — One part requires 50551 parts of water, or 23450 parts of a dilute solution of Acetate of Ammonium, Carbonate of Ammonium, and Ammonia for Solution.

**Sulphate of Lead.** — One part dissolves in 22816 parts of pure water, and in 36504 parts of water containing Sulphuric acid.

# WEIGHTS AND MEASURES.

## FRENCH WEIGHTS AND MEASURES.

### *Measure of Length.*

| | | | |
|---|---|---|---|
| One | Myriametre | = 10000 | Metres. |
| " | Kilometre | = 1000 | " |
| " | Hectometre | = 100 | " |
| " | Decametre | = 10 | " |
| " | Metre | = 1 | " |
| " | Decimetre | = 0.1 | " |
| " | Centimetre | = 0.01 | " |
| " | Millimetre | = 0.001 | " |

### *Square Measure.*

| | | | | |
|---|---|---|---|---|
| One | Centiare | = | 1 | Square Metre. |
| " | Are | = | 100 | " Metres. |
| " | Hectare | = | 10,000 | " " |

### *Cubic Measure.*

| | | | | |
|---|---|---|---|---|
| One | Cubic Metre | = | 1 | Cubic Metre. |
| " | " Decimetre | = | 0.001 | " |
| " | " Centimetre | = | 0.000,001 | " |
| " | " Millimetre | = | 0.000,000,001 | " |
| One | Litre | = | 1000 c.c. | |

### *Weights.*

| | | | |
|---|---|---|---|
| One | Kilogramme | = 1000 | Grammes. |
| " | Hectogramme | = 100 | " |
| " | Decagramme | = 10 | " |
| " | Gramme | = 1 | " |
| " | Decigramme | = 0.1 | " |
| " | Centigramme | = 0.01 | " |
| " | Milligramme | = 0.001 | " |

One Gramme = 15.4336 Grains = one Cubic Centimetre of water at .9° C. and 760 m.m. pressure.

## VALUES OF ENGLISH WEIGHTS AND MEASURES IN FRENCH OR DECIMAL.

### *Wine Measure.*

| | | | |
|---|---|---|---|
| One | Gallon | = | 4.5435 Litres. |
| " | Quart | = | 1.1359 " |
| " | Pint | = | .5679 " |
| " | Gill | = | .1420 " |
| " | Fluid Ounce | = | 28.4 Cubic Centimetres. |

### *Long Measure.*

| | | | |
|---|---|---|---|
| One | Mile | = | 1609.4083 Metres. |
| " | Furlong | = | 201.1760 " |
| " | Rod | = | 5.0297 " |
| " | Yard | = | .9144 " |
| " | Foot | = | .3048 " |
| " | Inch | = | 2.54 Centimetres. |
| " | Line | = | .21 " |

### *Square Measure.*

| | | | | |
|---|---|---|---|---|
| One | Square | Mile | = | 258.9894 Hectares. |
| " | " | Acre | = | 40.4671 Ares. |
| " | " | Rood | = | 10.1168 " |
| " | " | Rod | = | 25.292 Square Metres. |
| " | " | Yard | = | 0.8360 " " |
| " | " | Foot | = | .0929 " " |
| " | " | Inch | = | 6.45 " Centimetres. |

### *Cubic Measure.*

| | | | | |
|---|---|---|---|---|
| One | Cubic | Foot | = | 28315.3119 Cubic Centimetres. |
| " | " | Inch | = | 16.3862 " " |

*Avoirdupois Weight.*

| | | | |
|---|---|---|---|
| One | Ton, 2000 lbs., | = | 907.18530 Kilogrammes. |
| " | Hundred Wt., 100 lbs., | = | 45.359265 " |
| " | Pound | = | .45359265 " |
| " | Ounce | = | 28.3494 Grammes. |
| " | Dram | = | 1.7718 " |

*Troy Weight.*

| | | | |
|---|---|---|---|
| One | Pound | = | 373.242 Grammes. |
| " | Ounce | = | 31.1035 " |
| " | Pennyweight | = | 1.5522 " |
| " | Grain | = | .0648 " |

*Apothecaries' Weight.*

| | | | |
|---|---|---|---|
| One | Pound | = | 373.242 Grammes. |
| " | Ounce | = | 31.1035 " |
| " | Dram | = | 3.8779 " |
| | Scruple | = | 1.296 " |
| " | Grain | = | .0648 " |

# TABLE OF LOGARITHMS.

# TABLE

## OF LOGARITHMS FROM 1 TO 100.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 0.00000 | 26 | 1.41497 | 51 | 1.70757 | 76 | 1.88081 |
| 2 | 0.30103 | 27 | 1.43136 | 52 | 1.71600 | 77 | 1.88649 |
| 3 | 0.47712 | 28 | 1.44716 | 53 | 1.72428 | 78 | 1.89209 |
| 4 | 0.60206 | 29 | 1.46240 | 54 | 1.73239 | 79 | 1.89763 |
| 5 | 0.69897 | 30 | 1.47712 | 55 | 1.74036 | 80 | 1.90309 |
| 6 | 0.77815 | 31 | 1.49136 | 56 | 1.74819 | 81 | 1.90849 |
| 7 | 0.84510 | 32 | 1.50515 | 57 | 1.75587 | 82 | 1.91381 |
| 8 | 0.90309 | 33 | 1.51851 | 58 | 1.76343 | 83 | 1.91908 |
| 9 | 0.95424 | 34 | 1.53148 | 59 | 1.77085 | 84 | 1.92428 |
| 10 | 1.00000 | 35 | 1.54407 | 60 | 1.77815 | 85 | 1.92942 |
| 11 | 1.04139 | 36 | 1.55630 | 61 | 1.78533 | 86 | 1.93450 |
| 12 | 1.07918 | 37 | 1.56820 | 62 | 1.79239 | 87 | 1.93952 |
| 13 | 1.11394 | 38 | 1.57978 | 63 | 1.79934 | 88 | 1.94448 |
| 14 | 1.14613 | 39 | 1.59106 | 64 | 1.80618 | 89 | 1.94939 |
| 15 | 1.17609 | 40 | 1.60206 | 65 | 1.81291 | 90 | 1.95424 |
| 16 | 1.20412 | 41 | 1.61278 | 66 | 1.81954 | 91 | 1.95904 |
| 17 | 1.23045 | 42 | 1.62325 | 67 | 1.82607 | 92 | 1.96379 |
| 18 | 1.25527 | 43 | 1.63347 | 68 | 1.83251 | 93 | 1.96848 |
| 19 | 1.27875 | 44 | 1.64345 | 69 | 1.83885 | 94 | 1.97313 |
| 20 | 1.30103 | 45 | 1.65321 | 70 | 1.84510 | 95 | 1.97772 |
| 21 | 1.32222 | 46 | 1.66276 | 71 | 1.85126 | 96 | 1.98227 |
| 22 | 1.34242 | 47 | 1.67210 | 72 | 1.85733 | 97 | 1.98677 |
| 23 | 1.36173 | 48 | 1.68124 | 73 | 1.86332 | 98 | 1.99123 |
| 24 | 1.38021 | 49 | 1.69020 | 74 | 1.86923 | 99 | 1.99564 |
| 25 | 1.39794 | 50 | 1.69897 | 75 | 1.87506 | 100 | 2.00000 |

NOTE. — In the following table the two leading figures in the first column of Logarithms are to be prefixed to all the numbers of the same horizontal line in the next nine columns, but when an asterisk (*) occurs, the two leading figures are to be taken from the next lower line.

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 100 | 00000 | 043 | 087 | 130 | 173 | 217 | 260 | 303 | 346 | 389 |
| 101 | 432 | 475 | 518 | 561 | 604 | 647 | 689 | 732 | 775 | 817 |
| 102 | 860 | 903 | 945 | 988 | *030 | *072 | *115 | *157 | *199 | *242 |
| 103 | 01284 | 326 | 368 | 410 | 452 | 494 | 536 | 578 | 620 | 662 |
| 104 | 703 | 745 | 787 | 828 | 870 | 912 | 953 | 995 | *036 | *078 |
| 105 | 02119 | 160 | 202 | 243 | 284 | 325 | 366 | 407 | 449 | 490 |
| 106 | 531 | 572 | 612 | 653 | 694 | 735 | 776 | 816 | 857 | 898 |
| 107 | 938 | 979 | *019 | *060 | *100 | *141 | *181 | *222 | *262 | *302 |
| 108 | 03342 | 383 | 423 | 463 | 503 | 543 | 583 | 623 | 663 | 703 |
| 109 | 743 | 782 | 822 | 862 | 902 | 941 | 981 | *021 | *060 | *100 |
| 110 | 04139 | 179 | 218 | 258 | 297 | 336 | 376 | 415 | 454 | 493 |
| 111 | 532 | 571 | 610 | 650 | 689 | 727 | 766 | 805 | 844 | 883 |
| 112 | 922 | 961 | 999 | *038 | *077 | *115 | *154 | *192 | *231 | *269 |
| 113 | 05308 | 346 | 385 | 423 | 461 | 500 | 538 | 576 | 614 | 652 |
| 114 | 690 | 729 | 767 | 805 | 843 | 881 | 918 | 956 | 994 | *032 |
| 115 | 06070 | 108 | 145 | 183 | 221 | 258 | 296 | 333 | 371 | 408 |
| 116 | 446 | 483 | 521 | 558 | 595 | 633 | 670 | 707 | 744 | 781 |
| 117 | 819 | 856 | 893 | 930 | 967 | *004 | *041 | *078 | *115 | *151 |
| 118 | 07188 | 225 | 262 | 298 | 335 | 372 | 408 | 445 | 482 | 518 |
| 119 | 555 | 591 | 628 | 664 | 700 | 737 | 773 | 809 | 846 | 882 |
| 120 | 918 | 954 | 990 | *027 | *063 | *099 | *135 | *171 | *207 | *243 |
| 121 | 08279 | 314 | 350 | 386 | 422 | 458 | 493 | 529 | 565 | 600 |
| 122 | 636 | 672 | 707 | 743 | 778 | 814 | 849 | 884 | 920 | 955 |
| 123 | 991 | *026 | *061 | *096 | *132 | *167 | *202 | *237 | *272 | *307 |
| 124 | 09342 | 377 | 412 | 447 | 482 | 517 | 552 | 587 | 621 | 656 |
| 125 | 691 | 726 | 760 | 795 | 830 | 864 | 899 | 934 | 968 | *003 |
| 126 | 10037 | 072 | 106 | 140 | 175 | 209 | 243 | 278 | 312 | 346 |
| 127 | 380 | 415 | 449 | 483 | 517 | 551 | 585 | 619 | 653 | 687 |
| 128 | 721 | 755 | 789 | 823 | 857 | 890 | 924 | 958 | 992 | *025 |
| 129 | 11059 | 093 | 126 | 160 | 193 | 227 | 261 | 294 | 327 | 361 |
| 130 | 394 | 428 | 461 | 494 | 528 | 561 | 594 | 628 | 661 | 694 |
| 131 | 727 | 760 | 793 | 826 | 860 | 893 | 926 | 959 | 992 | *024 |
| 132 | 12057 | 090 | 123 | 156 | 189 | 222 | 254 | 287 | 320 | 352 |
| 133 | 385 | 418 | 450 | 483 | 516 | 548 | 581 | 613 | 646 | 678 |
| 134 | 710 | 743 | 775 | 808 | 840 | 872 | 905 | 937 | 969 | *001 |
| 135 | 13033 | 066 | 098 | 130 | 162 | 194 | 226 | 258 | 290 | 322 |
| 136 | 354 | 386 | 418 | 450 | 481 | 513 | 545 | 577 | 609 | 640 |
| 137 | 672 | 704 | 735 | 767 | 799 | 830 | 862 | 893 | 925 | 956 |
| 138 | 988 | *019 | *051 | *082 | *114 | *145 | *176 | *208 | *239 | *270 |
| 139 | 14301 | 333 | 364 | 395 | 426 | 457 | 489 | 520 | 551 | 582 |

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 140 | 14613 | 644 | 675 | 706 | 737 | 768 | 799 | 829 | 860 | 891 |
| 141 | 922 | 953 | 983 | *014 | *045 | *076 | *106 | *137 | *168 | *198 |
| 142 | 15229 | 259 | 290 | 320 | 351 | 381 | 412 | 442 | 473 | 503 |
| 143 | 534 | 564 | 594 | 625 | 655 | 685 | 715 | 746 | 776 | 806 |
| 144 | 836 | 866 | 897 | 927 | 957 | 987 | *017 | *047 | *077 | *107 |
| 145 | 16137 | 167 | 197 | 227 | 256 | 286 | 316 | 346 | 376 | 406 |
| 146 | 435 | 465 | 495 | 524 | 554 | 584 | 613 | 643 | 673 | 702 |
| 147 | 732 | 761 | 791 | 820 | 850 | 879 | 909 | 938 | 967 | 997 |
| 148 | 17026 | 056 | 085 | 114 | 143 | 173 | 202 | 231 | 260 | 289 |
| 149 | 319 | 348 | 377 | 406 | 435 | 464 | 493 | 522 | 551 | 580 |
| 150 | 609 | 638 | 667 | 696 | 725 | 754 | 782 | 811 | 840 | 869 |
| 151 | 898 | 926 | 955 | 984 | *013 | *041 | *070 | *099 | *127 | *156 |
| 152 | 18184 | 213 | 241 | 270 | 298 | 327 | 355 | 384 | 412 | 441 |
| 153 | 469 | 498 | 526 | 554 | 583 | 611 | 639 | 667 | 696 | 724 |
| 154 | 752 | 780 | 808 | 837 | 865 | 893 | 921 | 949 | 977 | *005 |
| 155 | 19033 | 061 | 089 | 117 | 145 | 173 | 201 | 229 | 257 | 285 |
| 156 | 312 | 340 | 368 | 396 | 424 | 451 | 479 | 507 | 535 | 562 |
| 157 | 590 | 618 | 645 | 673 | 700 | 728 | 756 | 783 | 811 | 838 |
| 158 | 866 | 893 | 921 | 948 | 976 | *003 | *030 | *058 | *085 | *112 |
| 159 | 20140 | 167 | 194 | 222 | 249 | 276 | 303 | 330 | 358 | 385 |
| 160 | 412 | 439 | 466 | 493 | 520 | 548 | 575 | 602 | 629 | 656 |
| 161 | 683 | 710 | 737 | 763 | 790 | 817 | 844 | 871 | 898 | 925 |
| 162 | 952 | 978 | *005 | *032 | *059 | *085 | *112 | *139 | *165 | *192 |
| 163 | 21219 | 245 | 272 | 299 | 325 | 352 | 378 | 405 | 431 | 458 |
| 164 | 484 | 511 | 537 | 564 | 590 | 617 | 643 | 669 | 696 | 722 |
| 165 | 748 | 775 | 801 | 827 | 854 | 880 | 906 | 932 | 958 | 985 |
| 166 | 22011 | 037 | 063 | 089 | 115 | 141 | 167 | 194 | 220 | 246 |
| 167 | 272 | 298 | 324 | 350 | 376 | 401 | 427 | 453 | 479 | 505 |
| 168 | 531 | 557 | 583 | 608 | 634 | 660 | 686 | 712 | 737 | 763 |
| 169 | 789 | 814 | 840 | 866 | 891 | 917 | 943 | 968 | 994 | *019 |
| 170 | 23045 | 070 | 096 | 121 | 147 | 172 | 198 | 223 | 249 | 274 |
| 171 | 300 | 325 | 350 | 376 | 401 | 426 | 452 | 477 | 502 | 528 |
| 172 | 553 | 578 | 603 | 629 | 654 | 679 | 704 | 729 | 754 | 779 |
| 173 | 805 | 830 | 855 | 880 | 905 | 930 | 955 | 980 | *005 | *030 |
| 174 | 24055 | 080 | 105 | 130 | 155 | 180 | 204 | 229 | 254 | 279 |
| 175 | 304 | 329 | 353 | 378 | 403 | 428 | 452 | 477 | 502 | 527 |
| 176 | 551 | 576 | 601 | 625 | 650 | 674 | 699 | 724 | 748 | 773 |
| 177 | 797 | 822 | 846 | 871 | 895 | 920 | 944 | 969 | 993 | *018 |
| 178 | 25042 | 066 | 091 | 115 | 139 | 164 | 188 | 212 | 237 | 261 |
| 179 | 285 | 310 | 334 | 358 | 382 | 406 | 431 | 455 | 479 | 503 |

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 180 | 25527 | 551 | 575 | 600 | 624 | 648 | 672 | 696 | 720 | 744 |
| 181 | 768 | 792 | 816 | 840 | 864 | 888 | 912 | 935 | 959 | 983 |
| 182 | 26007 | 031 | 055 | 079 | 102 | 126 | 150 | 174 | 198 | 221 |
| 183 | 245 | 269 | 293 | 316 | 340 | 364 | 387 | 411 | 435 | 458 |
| 184 | 482 | 505 | 529 | 553 | 576 | 600 | 623 | 647 | 670 | 694 |
| 185 | 717 | 741 | 764 | 788 | 811 | 834 | 858 | 881 | 905 | 928 |
| 186 | 951 | 975 | 998 | *021 | *045 | *068 | *091 | *114 | *138 | *161 |
| 187 | 27184 | 207 | 231 | 254 | 277 | 300 | 323 | 346 | 370 | 393 |
| 188 | 416 | 439 | 462 | 485 | 508 | 531 | 554 | 577 | 600 | 623 |
| 189 | 646 | 669 | 692 | 715 | 738 | 761 | 784 | 807 | 830 | 852 |
| 190 | 875 | 898 | 921 | 944 | 967 | 989 | *012 | *035 | *058 | *081 |
| 191 | 28103 | 126 | 149 | 171 | 194 | 217 | 240 | 262 | 285 | 307 |
| 192 | 330 | 353 | 375 | 398 | 421 | 443 | 466 | 488 | 511 | 533 |
| 193 | 556 | 578 | 601 | 623 | 646 | 668 | 691 | 713 | 735 | 758 |
| 194 | 780 | 803 | 825 | 847 | 870 | 892 | 914 | 937 | 959 | 981 |
| 195 | 29003 | 026 | 048 | 070 | 092 | 115 | 137 | 159 | 181 | 203 |
| 196 | 226 | 248 | 270 | 292 | 314 | 336 | 358 | 380 | 403 | 425 |
| 197 | 447 | 469 | 491 | 513 | 535 | 557 | 579 | 601 | 623 | 645 |
| 198 | 667 | 688 | 710 | 732 | 754 | 776 | 798 | 820 | 842 | 863 |
| 199 | 885 | 907 | 929 | 951 | 973 | 994 | *016 | *038 | *060 | *081 |
| 200 | 30103 | 125 | 146 | 168 | 190 | 211 | 233 | 255 | 276 | 298 |
| 201 | 320 | 341 | 363 | 384 | 406 | 428 | 449 | 471 | 492 | 514 |
| 202 | 535 | 557 | 578 | 600 | 621 | 643 | 664 | 685 | 707 | 728 |
| 203 | 750 | 771 | 792 | 814 | 835 | 856 | 878 | 899 | 920 | 942 |
| 204 | 963 | 984 | *006 | *027 | *048 | *069 | *091 | *112 | *133 | *154 |
| 205 | 31175 | 197 | 218 | 239 | 260 | 281 | 302 | 323 | 345 | 366 |
| 206 | 387 | 408 | 429 | 450 | 471 | 492 | 513 | 534 | 555 | 576 |
| 207 | 597 | 618 | 639 | 660 | 681 | 702 | 723 | 744 | 765 | 785 |
| 208 | 806 | 827 | 848 | 869 | 890 | 911 | 931 | 952 | 973 | 994 |
| 209 | 32015 | 035 | 056 | 077 | 098 | 118 | 139 | 160 | 181 | 201 |
| 210 | 222 | 243 | 263 | 284 | 305 | 325 | 346 | 366 | 387 | 408 |
| 211 | 428 | 449 | 469 | 490 | 510 | 531 | 552 | 572 | 593 | 613 |
| 212 | 634 | 654 | 675 | 695 | 715 | 736 | 756 | 777 | 797 | 818 |
| 213 | 838 | 858 | 879 | 899 | 919 | 940 | 960 | 980 | *001 | *021 |
| 214 | 33041 | 062 | 082 | 102 | 122 | 143 | 163 | 183 | 203 | 224 |
| 215 | 244 | 264 | 284 | 304 | 325 | 345 | 365 | 385 | 405 | 425 |
| 216 | 445 | 465 | 486 | 506 | 526 | 546 | 566 | 586 | 606 | 626 |
| 217 | 646 | 666 | 686 | 706 | 726 | 746 | 766 | 786 | 806 | 826 |
| 218 | 846 | 866 | 885 | 905 | 925 | 945 | 965 | 985 | *005 | *025 |
| 219 | 34044 | 064 | 084 | 104 | 124 | 143 | 163 | 183 | 203 | 223 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 220 | 34242 | 262 | 282 | 301 | 321 | 341 | 361 | 380 | 400 | 420 |
| 221 | 439 | 459 | 479 | 498 | 518 | 537 | 557 | 577 | 596 | 616 |
| 222 | 635 | 655 | 674 | 694 | 713 | 733 | 753 | 772 | 792 | 811 |
| 223 | 830 | 850 | 869 | 889 | 908 | 928 | 947 | 967 | 986 | *005 |
| 224 | 35025 | 044 | 064 | 083 | 102 | 122 | 141 | 160 | 180 | 199 |
| 225 | 218 | 238 | 257 | 276 | 295 | 315 | 334 | 353 | 372 | 392 |
| 226 | 411 | 430 | 449 | 468 | 488 | 507 | 526 | 545 | 564 | 583 |
| 227 | 603 | 622 | 641 | 660 | 679 | 698 | 717 | 736 | 755 | 774 |
| *228 | 793 | 813 | 832 | 851 | 870 | 889 | 908 | 927 | 946 | 965 |
| 229 | 984 | *003 | *021 | *040 | *059 | *078 | *097 | *116 | *135 | *154 |
| 230 | 36173 | 192 | 211 | 229 | 248 | 267 | 286 | 305 | 324 | 342 |
| 231 | 361 | 380 | 399 | 418 | 436 | 455 | 474 | 493 | 511 | 530 |
| 232 | 549 | 568 | 586 | 605 | 624 | 642 | 661 | 680 | 698 | 717 |
| 233 | 736 | 754 | 773 | 791 | 810 | 829 | 847 | 866 | 884 | 903 |
| 234 | 922 | 940 | 959 | 977 | 996 | *014 | *033 | *051 | *070 | *088 |
| 235 | 37107 | 125 | 144 | 162 | 181 | 199 | 218 | 236 | 254 | 273 |
| 236 | 291 | 310 | 328 | 346 | 365 | 383 | 401 | 420 | 438 | 457 |
| 237 | 475 | 493 | 511 | 530 | 548 | 566 | 585 | 603 | 621 | 639 |
| 238 | 658 | 676 | 694 | 712 | 731 | 749 | 767 | 785 | 803 | 822 |
| 239 | 840 | 858 | 876 | 894 | 912 | 931 | 949 | 967 | 985 | *003 |
| 240 | 38021 | 039 | 057 | 075 | 093 | 112 | 130 | 148 | 166 | 184 |
| 241 | 202 | 220 | 238 | 256 | 274 | 292 | 310 | 328 | 346 | 364 |
| 242 | 382 | 399 | 417 | 435 | 453 | 471 | 489 | 507 | 525 | 543 |
| 243 | 561 | 578 | 596 | 614 | 632 | 650 | 668 | 686 | 703 | 721 |
| 244 | 739 | 757 | 775 | 792 | 810 | 828 | 846 | 863 | 881 | 899 |
| 245 | 917 | 934 | 952 | 970 | 987 | *005 | *023 | *041 | *058 | *076 |
| 246 | 39094 | 111 | 129 | 146 | 164 | 182 | 199 | 217 | 235 | 252 |
| 247 | 270 | 287 | 305 | 322 | 340 | 358 | 375 | 393 | 410 | 428 |
| 248 | 445 | 463 | 480 | 498 | 515 | 533 | 550 | 568 | 585 | 602 |
| 249 | 620 | 637 | 655 | 672 | 690 | 707 | 724 | 742 | 759 | 777 |
| 250 | 794 | 811 | 829 | 846 | 863 | 881 | 898 | 915 | 933 | 950 |
| 251 | 967 | 985 | *002 | *019 | *037 | *054 | *071 | *088 | *106 | *123 |
| 252 | 40140 | 157 | 175 | 192 | 209 | 226 | 243 | 261 | 278 | 295 |
| 253 | 312 | 329 | 346 | 364 | 381 | 398 | 415 | 432 | 449 | 466 |
| 254 | 483 | 500 | 518 | 535 | 552 | 569 | 586 | 603 | 620 | 637 |
| 255 | 654 | 671 | 688 | 705 | 722 | 739 | 756 | 773 | 790 | 807 |
| 256 | 824 | 841 | 858 | 875 | 892 | 909 | 926 | 943 | 960 | 976 |
| 257 | 993 | *010 | *027 | *044 | *061 | *078 | *095 | *111 | *128 | *145 |
| 258 | 41162 | 179 | 196 | 212 | 229 | 246 | 263 | 280 | 296 | 313 |
| 259 | 330 | 347 | 363 | 380 | 397 | 414 | 430 | 447 | 464 | 481 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 260 | 41497 | 514 | 531 | 547 | 564 | 581 | 597 | 614 | 631 | 647 |
| 261 | 664 | 681 | 697 | 714 | 731 | 747 | 764 | 780 | 797 | 814 |
| 262 | 830 | 847 | 863 | 880 | 896 | 913 | 929 | 946 | 963 | 979 |
| 263 | 996 | *012 | *029 | *045 | *062 | *078 | *095 | *111 | *127 | *144 |
| 264 | 42160 | 177 | 193 | 210 | 226 | 243 | 259 | 275 | 292 | 308 |
| 265 | 325 | 341 | 357 | 374 | 390 | 406 | 423 | 439 | 455 | 472 |
| 266 | 488 | 504 | 521 | 537 | 553 | 570 | 586 | 602 | 619 | 635 |
| 267 | 651 | 667 | 684 | 700 | 716 | 732 | 749 | 765 | 781 | 797 |
| 268 | 813 | 830 | 846 | 862 | 878 | 894 | 911 | 927 | 943 | 959 |
| 269 | 975 | 991 | *008 | *024 | *040 | *056 | *072 | *088 | *104 | *120 |
| 270 | 43136 | 152 | 169 | 185 | 201 | 217 | 233 | 249 | 265 | 281 |
| 271 | 297 | 313 | 329 | 345 | 361 | 377 | 393 | 409 | 425 | 441 |
| 272 | 457 | 473 | 489 | 505 | 521 | 537 | 553 | 569 | 584 | 600 |
| 273 | 616 | 632 | 648 | 664 | 680 | 696 | 712 | 727 | 743 | 759 |
| 274 | 775 | 791 | 807 | 823 | 838 | 854 | 870 | 886 | 902 | 917 |
| 275 | 933 | 949 | 965 | 981 | 996 | *012 | *028 | *044 | *059 | *075 |
| 276 | 44091 | 107 | 122 | 138 | 154 | 170 | 185 | 201 | 217 | 232 |
| 277 | 248 | 264 | 279 | 295 | 311 | 326 | 342 | 358 | 373 | 389 |
| 278 | 404 | 420 | 436 | 451 | 467 | 483 | 498 | 514 | 529 | 545 |
| 279 | 560 | 576 | 592 | 607 | 623 | 638 | 654 | 669 | 685 | 700 |
| 280 | 716 | 731 | 747 | 762 | 778 | 793 | 809 | 824 | 840 | 855 |
| 281 | 871 | 886 | 902 | 917 | 932 | 948 | 963 | 979 | 994 | *010 |
| 282 | 45025 | 040 | 056 | 071 | 086 | 102 | 117 | 133 | 148 | 163 |
| 283 | 179 | 194 | 209 | 225 | 240 | 255 | 271 | 286 | 301 | 317 |
| 284 | 332 | 347 | 362 | 378 | 393 | 408 | 423 | 439 | 454 | 469 |
| 285 | 484 | 500 | 515 | 530 | 545 | 561 | 576 | 591 | 606 | 621 |
| 286 | 637 | 652 | 667 | 682 | 697 | 712 | 728 | 743 | 758 | 773 |
| 287 | 788 | 803 | 818 | 834 | 849 | 864 | 879 | 894 | 909 | 924 |
| 288 | 939 | 954 | 969 | 984 | *000 | *015 | *030 | *045 | *060 | *075 |
| 289 | 46090 | 105 | 120 | 135 | 150 | 165 | 180 | 195 | 210 | 225 |
| 290 | 240 | 255 | 270 | 285 | 300 | 315 | 330 | 345 | 359 | 374 |
| 291 | 389 | 404 | 419 | 434 | 449 | 464 | 479 | 494 | 509 | 523 |
| 292 | 538 | 553 | 568 | 583 | 598 | 613 | 627 | 642 | 657 | 672 |
| 293 | 687 | 702 | 716 | 731 | 746 | 761 | 776 | 790 | 805 | 820 |
| 294 | 835 | 850 | 864 | 879 | 894 | 909 | 923 | 938 | 953 | 967 |
| 295 | 982 | 997 | *012 | *026 | *041 | *056 | *070 | *085 | *100 | *114 |
| 296 | 47129 | 144 | 159 | 173 | 188 | 202 | 217 | 232 | 246 | 261 |
| 297 | 276 | 290 | 305 | 319 | 334 | 349 | 363 | 378 | 392 | 407 |
| 298 | 422 | 436 | 451 | 465 | 480 | 494 | 509 | 524 | 538 | 553 |
| 299 | 567 | 582 | 596 | 611 | 625 | 640 | 654 | 669 | 683 | 698 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 47712 | 727 | 741 | 756 | 770 | 784 | 799 | 813 | 828 | 842 |
| 301 | 857 | 871 | 885 | 900 | 914 | 929 | 943 | 958 | 972 | 986 |
| 302 | 48001 | 015 | 029 | 044 | 058 | 073 | 087 | 101 | 116 | 130 |
| 303 | 144 | 159 | 173 | 187 | 202 | 216 | 230 | 244 | 259 | 273 |
| 304 | 287 | 302 | 316 | 330 | 344 | 359 | 373 | 387 | 401 | 416 |
| 305 | 430 | 444 | 458 | 473 | 487 | 501 | 515 | 530 | 544 | 558 |
| 306 | 572 | 586 | 601 | 615 | 629 | 643 | 657 | 671 | 686 | 700 |
| 307 | 714 | 728 | 742 | 756 | 770 | 785 | 799 | 813 | 827 | 841 |
| 308 | 855 | 869 | 883 | 897 | 911 | 926 | 940 | 954 | 968 | 982 |
| 309 | 996 | *010 | *024 | *038 | *052 | *066 | *080 | *094 | *108 | *122 |
| 310 | 49136 | 150 | 164 | 178 | 192 | 206 | 220 | 234 | 248 | 262 |
| 311 | 276 | 290 | 304 | 318 | 332 | 346 | 360 | 374 | 388 | 402 |
| 312 | 415 | 429 | 443 | 457 | 471 | 485 | 499 | 513 | 527 | 541 |
| 313 | 554 | 568 | 582 | 596 | 610 | 624 | 638 | 651 | 665 | 679 |
| 314 | 693 | 707 | 721 | 734 | 748 | 762 | 776 | 790 | 803 | 817 |
| 315 | 831 | 845 | 859 | 872 | 886 | 900 | 914 | 927 | 941 | 955 |
| 316 | 969 | 982 | 996 | *010 | *024 | *037 | *051 | *065 | *079 | *092 |
| 317 | 50106 | 120 | 133 | 147 | 161 | 174 | 188 | 202 | 215 | 229 |
| 318 | 243 | 256 | 270 | 284 | 297 | 311 | 325 | 338 | 352 | 365 |
| 319 | 379 | 393 | 406 | 420 | 433 | 447 | 461 | 474 | 488 | 501 |
| 320 | 515 | 529 | 542 | 556 | 569 | 583 | 596 | 610 | 623 | 637 |
| 321 | 651 | 664 | 678 | 691 | 705 | 718 | 732 | 745 | 759 | 772 |
| 322 | 786 | 799 | 813 | 826 | 840 | 853 | 866 | 880 | 893 | 907 |
| 323 | 920 | 934 | 947 | 961 | 974 | 987 | *001 | *014 | *028 | *041 |
| 324 | 51055 | 068 | 081 | 095 | 108 | 121 | 135 | 148 | 162 | 175 |
| 325 | 188 | 202 | 215 | 228 | 242 | 255 | 268 | 282 | 295 | 308 |
| 326 | 322 | 335 | 348 | 362 | 375 | 388 | 402 | 415 | 428 | 441 |
| 327 | 455 | 468 | 481 | 495 | 508 | 521 | 534 | 548 | 561 | 574 |
| 328 | 587 | 601 | 614 | 627 | 640 | 654 | 667 | 680 | 693 | 706 |
| 329 | 720 | 733 | 746 | 759 | 772 | 786 | 799 | 812 | 825 | 838 |
| 330 | 851 | 865 | 878 | 891 | 904 | 917 | 930 | 943 | 957 | 970 |
| 331 | 983 | 996 | *009 | *022 | *035 | *048 | *061 | *075 | *088 | *101 |
| 332 | 52114 | 127 | 140 | 153 | 166 | 179 | 192 | 205 | 218 | 231 |
| 333 | 244 | 257 | 270 | 284 | 297 | 310 | 323 | 336 | 349 | 362 |
| 334 | 375 | 388 | 401 | 414 | 427 | 440 | 453 | 466 | 479 | 492 |
| 335 | 504 | 517 | 530 | 543 | 556 | 569 | 582 | 595 | 608 | 621 |
| 336 | 634 | 647 | 660 | 673 | 686 | 699 | 711 | 724 | 737 | 750 |
| 337 | 763 | 776 | 789 | 802 | 815 | 827 | 840 | 853 | 866 | 879 |
| 338 | 892 | 905 | 917 | 930 | 943 | 956 | 969 | 982 | 994 | *007 |
| 339 | 53020 | 033 | 046 | 058 | 071 | 084 | 097 | 110 | 122 | 135 |

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| 340 | 53148 | 161 | 173 | 186 | 199 | 212 | 224 | 237 | 250 | 263 |
| 341 | 275 | 288 | 301 | 314 | 326 | 339 | 352 | 364 | 377 | 390 |
| 342 | 403 | 415 | 428 | 441 | 453 | 466 | 479 | 491 | 504 | 517 |
| 343 | 529 | 542 | 555 | 567 | 580 | 593 | 605 | 618 | 631 | 643 |
| 344 | 656 | 668 | 681 | 694 | 706 | 719 | 732 | 744 | 757 | 769 |
| 345 | 782 | 794 | 807 | 820 | 832 | 845 | 857 | 870 | 882 | 895 |
| 346 | 908 | 920 | 933 | 945 | 958 | 970 | 983 | 995 | *008 | *020 |
| 347 | 54033 | 045 | 058 | 070 | 083 | 095 | 108 | 120 | 133 | 145 |
| 348 | 158 | 170 | 183 | 195 | 208 | 220 | 233 | 245 | 258 | 270 |
| 349 | 283 | 295 | 307 | 320 | 332 | 345 | 357 | 370 | 382 | 394 |
| 350 | 407 | 419 | 432 | 444 | 456 | 469 | 481 | 494 | 506 | 518 |
| 351 | 531 | 543 | 555 | 568 | 580 | 593 | 605 | 617 | 630 | 642 |
| 352 | 654 | 667 | 679 | 691 | 704 | 716 | 728 | 741 | 753 | 765 |
| 353 | 777 | 790 | 802 | 814 | 827 | 839 | 851 | 864 | 876 | 888 |
| 354 | 900 | 913 | 925 | 937 | 949 | 962 | 974 | 986 | 998 | *011 |
| 355 | 55023 | 035 | 047 | 060 | 072 | 084 | 096 | 108 | 121 | 133 |
| 356 | 145 | 157 | 169 | 182 | 194 | 206 | 218 | 230 | 242 | 255 |
| 357 | 267 | 279 | 291 | 303 | 315 | 328 | 340 | 352 | 364 | 376 |
| 358 | 388 | 400 | 413 | 425 | 437 | 449 | 461 | 473 | 485 | 497 |
| 359 | 509 | 522 | 534 | 546 | 558 | 570 | 582 | 594 | 606 | 618 |
| 360 | 630 | 642 | 654 | 666 | 678 | 691 | 703 | 715 | 727 | 739 |
| 361 | 751 | 763 | 775 | 787 | 799 | 811 | 823 | 835 | 847 | 859 |
| 362 | 871 | 883 | 895 | 907 | 919 | 931 | 943 | 955 | 967 | 979 |
| 363 | 991 | *003 | *015 | *027 | *038 | *050 | *062 | *074 | *086 | *098 |
| 364 | 56110 | 122 | 134 | 146 | 158 | 170 | 182 | 194 | 205 | 217 |
| 365 | 229 | 241 | 253 | 265 | 277 | 289 | 301 | 312 | 324 | 336 |
| 366 | 348 | 360 | 372 | 384 | 396 | 407 | 419 | 431 | 443 | 455 |
| 367 | 467 | 478 | 490 | 502 | 514 | 526 | 538 | 549 | 561 | 573 |
| 368 | 585 | 597 | 608 | 620 | 632 | 644 | 656 | 667 | 679 | 691 |
| 369 | 703 | 714 | 726 | 738 | 750 | 761 | 773 | 785 | 797 | 808 |
| 370 | 820 | 832 | 844 | 855 | 867 | 879 | 891 | 902 | 914 | 926 |
| 371 | 937 | 949 | 961 | 972 | 984 | 996 | *008 | *019 | *031 | *043 |
| 372 | 57054 | 066 | 078 | 089 | 101 | 113 | 124 | 136 | 148 | 159 |
| 373 | 171 | 183 | 194 | 206 | 217 | 229 | 241 | 252 | 264 | 276 |
| 374 | 287 | 299 | 310 | 322 | 334 | 345 | 357 | 368 | 380 | 392 |
| 375 | 403 | 415 | 426 | 438 | 449 | 461 | 473 | 484 | 496 | 507 |
| 376 | 519 | 530 | 542 | 553 | 565 | 576 | 588 | 600 | 611 | 623 |
| 377 | 634 | 646 | 657 | 669 | 680 | 692 | 703 | 715 | 726 | 738 |
| 378 | 749 | 761 | 772 | 784 | 795 | 807 | 818 | 830 | 841 | 852 |
| 379 | 864 | 875 | 887 | 898 | 910 | 921 | 933 | 944 | 955 | 967 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 380 | 57978 | 990 | *001 | *013 | *024 | *035 | *047 | *058 | *070 | *081 |
| 381 | 58092 | 104 | 115 | 127 | 138 | 149 | 161 | 172 | 184 | 195 |
| 382 | 206 | 218 | 229 | 240 | 252 | 263 | 274 | 286 | 297 | 309 |
| 383 | 320 | 331 | 343 | 354 | 365 | 377 | 388 | 399 | 410 | 422 |
| 384 | 433 | 444 | 456 | 467 | 478 | 490 | 501 | 512 | 524 | 535 |
| 385 | 546 | 557 | 569 | 580 | 591 | 602 | 614 | 625 | 636 | 647 |
| 386 | 659 | 670 | 681 | 692 | 704 | 715 | 726 | 737 | 749 | 760 |
| 387 | 771 | 782 | 794 | 805 | 816 | 827 | 838 | 850 | 861 | 872 |
| 388 | 883 | 894 | 906 | 917 | 928 | 939 | 950 | 961 | 973 | 984 |
| 389 | 995 | *006 | *017 | *028 | *040 | *051 | *062 | *073 | *084 | *095 |
| 390 | 59106 | 118 | 129 | 140 | 151 | 162 | 173 | 184 | 195 | 207 |
| 391 | 218 | 229 | 240 | 251 | 262 | 273 | 284 | 295 | 306 | 318 |
| 392 | 329 | 340 | 351 | 362 | 373 | 384 | 395 | 406 | 417 | 428 |
| 393 | 439 | 450 | 461 | 472 | 483 | 494 | 506 | 517 | 528 | 539 |
| 394 | 550 | 561 | 572 | 583 | 594 | 605 | 616 | 627 | 638 | 649 |
| 395 | 660 | 671 | 682 | 693 | 704 | 715 | 726 | 737 | 748 | 759 |
| 396 | 770 | 780 | 791 | 802 | 813 | 824 | 835 | 846 | 857 | 868 |
| 397 | 879 | 890 | 901 | 912 | 923 | 934 | 945 | 956 | 966 | 977 |
| 398 | 988 | 999 | *010 | *021 | *032 | *043 | *054 | *065 | *076 | *086 |
| 399 | 60097 | 108 | 119 | 130 | 141 | 152 | 163 | 173 | 184 | 195 |
| 400 | 206 | 217 | 228 | 239 | 249 | 260 | 271 | 282 | 293 | 304 |
| 401 | 314 | 325 | 336 | 347 | 358 | 369 | 379 | 390 | 401 | 412 |
| 402 | 423 | 433 | 444 | 455 | 466 | 477 | 487 | 498 | 509 | 520 |
| 403 | 531 | 541 | 552 | 563 | 574 | 584 | 595 | 606 | 617 | 627 |
| 404 | 638 | 649 | 660 | 670 | 681 | 692 | 703 | 713 | 724 | 735 |
| 405 | 746 | 756 | 767 | 778 | 788 | 799 | 810 | 821 | 831 | 842 |
| 406 | 853 | 863 | 874 | 885 | 895 | 906 | 917 | 927 | 938 | 949 |
| 407 | 959 | 970 | 981 | 991 | *002 | *013 | *023 | *034 | *045 | *055 |
| 408 | 61066 | 077 | 087 | 098 | 109 | 119 | 130 | 140 | 151 | 162 |
| 409 | 172 | 183 | 194 | 204 | 215 | 225 | 236 | 247 | 257 | 268 |
| 410 | 278 | 289 | 300 | 310 | 321 | 331 | 342 | 352 | 363 | 374 |
| 411 | 384 | 395 | 405 | 416 | 426 | 437 | 448 | 458 | 469 | 479 |
| 412 | 490 | 500 | 511 | 521 | 532 | 542 | 553 | 563 | 574 | 584 |
| 413 | 595 | 606 | 616 | 627 | 637 | 648 | 658 | 669 | 679 | 690 |
| 414 | 700 | 711 | 721 | 731 | 742 | 752 | 763 | 773 | 784 | 794 |
| 415 | 805 | 815 | 826 | 836 | 847 | 857 | 868 | 878 | 888 | 899 |
| 416 | 909 | 920 | 930 | 941 | 951 | 962 | 972 | 982 | 993 | *003 |
| 417 | 62014 | 024 | 034 | 045 | 055 | 066 | 076 | 086 | 097 | 107 |
| 418 | 118 | 128 | 138 | 149 | 159 | 170 | 180 | 190 | 201 | 211 |
| 419 | 221 | 232 | 242 | 252 | 263 | 273 | 284 | 294 | 304 | 315 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 420 | 62325 | 335 | 346 | 356 | 366 | 377 | 387 | 397 | 408 | 418 |
| 421 | 428 | 439 | 449 | 459 | 469 | 480 | 490 | 500 | 511 | 521 |
| 422 | 531 | 542 | 552 | 562 | 572 | 583 | 593 | 603 | 613 | 624 |
| 423 | 634 | 644 | 655 | 665 | 675 | 685 | 696 | 706 | 716 | 726 |
| 424 | 737 | 747 | 757 | 767 | 778 | 788 | 798 | 808 | 818 | 829 |
| 425 | 839 | 849 | 859 | 870 | 880 | 890 | 900 | 910 | 921 | 931 |
| 426 | 941 | 951 | 961 | 972 | 982 | 992 | *002 | *012 | *022 | *033 |
| 427 | 63043 | 053 | 063 | 073 | 083 | 094 | 104 | 114 | 124 | 134 |
| 428 | 144 | 155 | 165 | 175 | 185 | 195 | 205 | 215 | 225 | 236 |
| 429 | 246 | 256 | 266 | 276 | 286 | 296 | 306 | 317 | 327 | 337 |
| 430 | 347 | 357 | 367 | 377 | 387 | 397 | 407 | 417 | 428 | 438 |
| 431 | 448 | 458 | 468 | 478 | 488 | 498 | 508 | 518 | 528 | 538 |
| 432 | 548 | 558 | 568 | 579 | 589 | 599 | 609 | 619 | 629 | 639 |
| 433 | 649 | 659 | 669 | 679 | 689 | 699 | 709 | 719 | 729 | 739 |
| 434 | 749 | 759 | 769 | 779 | 789 | 799 | 809 | 819 | 829 | 839 |
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| 436 | 949 | 959 | 969 | 979 | 988 | 998 | *008 | *018 | *028 | *038 |
| 437 | 64048 | 058 | 068 | 078 | 088 | 098 | 108 | 118 | 128 | 137 |
| 438 | 147 | 157 | 167 | 177 | 187 | 197 | 207 | 217 | 227 | 237 |
| 439 | 246 | 256 | 266 | 276 | 286 | 296 | 306 | 316 | 326 | 335 |
| 440 | 345 | 355 | 365 | 375 | 385 | 395 | 404 | 414 | 424 | 434 |
| 441 | 444 | 454 | 464 | 473 | 483 | 493 | 503 | 513 | 523 | 532 |
| 442 | 542 | 552 | 562 | 572 | 582 | 591 | 601 | 611 | 621 | 631 |
| 443 | 640 | 650 | 660 | 670 | 680 | 689 | 699 | 709 | 719 | 729 |
| 444 | 738 | 748 | 758 | 768 | 777 | 787 | 797 | 807 | 816 | 826 |
| 445 | 836 | 846 | 856 | 865 | 875 | 885 | 895 | 904 | 914 | 924 |
| 446 | 933 | 943 | 953 | 963 | 972 | 982 | 992 | *002 | *011 | *021 |
| 447 | 65031 | 040 | 050 | 060 | 070 | 079 | 089 | 099 | 108 | 118 |
| 448 | 128 | 137 | 147 | 157 | 167 | 176 | 186 | 196 | 205 | 215 |
| 449 | 225 | 234 | 244 | 254 | 263 | 273 | 283 | 292 | 302 | 312 |
| 450 | 321 | 331 | 341 | 350 | 360 | 369 | 379 | 389 | 398 | 408 |
| 451 | 418 | 427 | 437 | 447 | 456 | 466 | 475 | 485 | 495 | 504 |
| 452 | 514 | 523 | 533 | 543 | 552 | 562 | 571 | 581 | 591 | 600 |
| 453 | 610 | 619 | 629 | 639 | 648 | 658 | 667 | 677 | 686 | 696 |
| 454 | 706 | 715 | 725 | 734 | 744 | 753 | 763 | 772 | 782 | 792 |
| 455 | 801 | 811 | 820 | 830 | 839 | 849 | 858 | 868 | 877 | 887 |
| 456 | 896 | 906 | 916 | 925 | 935 | 944 | 954 | 963 | 973 | 982 |
| 457 | 992 | *001 | *011 | *020 | *030 | *039 | *049 | *058 | *068 | *077 |
| 458 | 66087 | 096 | 106 | 115 | 124 | 134 | 143 | 153 | 162 | 172 |
| 459 | 181 | 191 | 200 | 210 | 219 | 229 | 238 | 247 | 257 | 266 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 460 | 66276 | 285 | 295 | 304 | 314 | 323 | 332 | 342 | 351 | 361 |
| 461 | 370 | 380 | 389 | 398 | 408 | 417 | 427 | 436 | 445 | 455 |
| 462 | 464 | 474 | 483 | 492 | 502 | 511 | 521 | 530 | 539 | 549 |
| 463 | 558 | 567 | 577 | 586 | 596 | 605 | 614 | 624 | 633 | 642 |
| 464 | 652 | 661 | 671 | 680 | 689 | 699 | 708 | 717 | 727 | 736 |
| 465 | 745 | 755 | 764 | 773 | 783 | 792 | 801 | 811 | 820 | 829 |
| 466 | 839 | 848 | 857 | 867 | 876 | 885 | 894 | 904 | 913 | 922 |
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| 469 | 117 | 127 | 136 | 145 | 154 | 164 | 173 | 182 | 191 | 201 |
| 470 | 210 | 219 | 228 | 237 | 247 | 256 | 265 | 274 | 284 | 293 |
| 471 | 302 | 311 | 321 | 330 | 339 | 348 | 357 | 367 | 376 | 385 |
| 472 | 394 | 403 | 413 | 422 | 431 | 440 | 449 | 459 | 468 | 477 |
| 473 | 486 | 495 | 504 | 514 | 523 | 532 | 541 | 550 | 560 | 569 |
| 474 | 578 | 587 | 596 | 605 | 614 | 624 | 633 | 642 | 651 | 660 |
| 475 | 669 | 679 | 688 | 697 | 706 | 715 | 724 | 733 | 742 | 752 |
| 476 | 761 | 770 | 779 | 788 | 797 | 806 | 815 | 825 | 834 | 843 |
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| 480 | 124 | 133 | 142 | 151 | 160 | 169 | 178 | 187 | 196 | 205 |
| 481 | 215 | 224 | 233 | 242 | 251 | 260 | 269 | 278 | 287 | 296 |
| 482 | 305 | 314 | 323 | 332 | 341 | 350 | 359 | 368 | 377 | 386 |
| 483 | 395 | 404 | 413 | 422 | 431 | 440 | 449 | 458 | 467 | 476 |
| 484 | 485 | 494 | 502 | 511 | 520 | 529 | 538 | 547 | 556 | 565 |
| 485 | 574 | 583 | 592 | 601 | 610 | 619 | 628 | 637 | 646 | 655 |
| 486 | 664 | 673 | 681 | 690 | 699 | 708 | 717 | 726 | 735 | 744 |
| 487 | 753 | 762 | 771 | 780 | 789 | 797 | 806 | 815 | 824 | 833 |
| 488 | 842 | 851 | 860 | 869 | 878 | 886 | 895 | 904 | 913 | 922 |
| 489 | 931 | 940 | 949 | 958 | 966 | 975 | 984 | 993 | *002 | *011 |
| 490 | 69020 | 028 | 037 | 046 | 055 | 064 | 073 | 082 | 090 | 099 |
| 491 | 108 | 117 | 126 | 135 | 144 | 152 | 161 | 170 | 179 | 188 |
| 492 | 197 | 205 | 214 | 223 | 232 | 241 | 249 | 258 | 267 | 276 |
| 493 | 285 | 294 | 302 | 311 | 320 | 329 | 338 | 346 | 355 | 364 |
| 494 | 373 | 381 | 390 | 399 | 408 | 417 | 425 | 434 | 443 | 452 |
| 495 | 461 | 469 | 478 | 487 | 496 | 504 | 513 | 522 | 531 | 539 |
| 496 | 548 | 557 | 566 | 574 | 583 | 592 | 601 | 609 | 618 | 627 |
| 497 | 636 | 644 | 653 | 662 | 671 | 679 | 688 | 697 | 705 | 714 |
| 498 | 723 | 732 | 740 | 749 | 758 | 767 | 775 | 784 | 793 | 801 |
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| 503 | 157 | 165 | 174 | 183 | 191 | 200 | 209 | 217 | 226 | 234 |
| 504 | 243 | 252 | 260 | 269 | 278 | 286 | 295 | 303 | 312 | 321 |
| 505 | 329 | 338 | 346 | 355 | 364 | 372 | 381 | 389 | 398 | 406 |
| 506 | 415 | 424 | 432 | 441 | 449 | 458 | 467 | 475 | 484 | 492 |
| 507 | 501 | 509 | 518 | 526 | 535 | 544 | 552 | 561 | 569 | 578 |
| 508 | 586 | 595 | 603 | 612 | 621 | 629 | 638 | 646 | 655 | 663 |
| 509 | 672 | 680 | 689 | 697 | 706 | 714 | 723 | 731 | 740 | 749 |
| 510 | 757 | 766 | 774 | 783 | 791 | 800 | 808 | 817 | 825 | 834 |
| 511 | 842 | 851 | 859 | 868 | 876 | 885 | 893 | 902 | 910 | 919 |
| 512 | 927 | 935 | 944 | 952 | 961 | 969 | 978 | 986 | 995 | *003 |
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| 514 | 096 | 105 | 113 | 122 | 130 | 139 | 147 | 155 | 164 | 172 |
| 515 | 181 | 189 | 198 | 206 | 214 | 223 | 231 | 240 | 248 | 257 |
| 516 | 265 | 273 | 282 | 290 | 299 | 307 | 315 | 324 | 332 | 341 |
| 517 | 349 | 357 | 366 | 374 | 383 | 391 | 399 | 408 | 416 | 425 |
| 518 | 433 | 541 | 450 | 458 | 466 | 475 | 483 | 492 | 500 | 508 |
| 519 | 517 | 525 | 533 | 542 | 550 | 559 | 567 | 575 | 584 | 592 |
| 520 | 600 | 609 | 617 | 625 | 634 | 642 | 650 | 659 | 667 | 675 |
| 521 | 684 | 692 | 700 | 709 | 717 | 725 | 734 | 742 | 750 | 759 |
| 522 | 767 | 775 | 784 | 792 | 800 | 809 | 817 | 825 | 834 | 842 |
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| 526 | 099 | 107 | 115 | 123 | 132 | 140 | 148 | 156 | 165 | 173 |
| 527 | 181 | 189 | 198 | 206 | 214 | 222 | 230 | 239 | 247 | 255 |
| 528 | 263 | 272 | 280 | 288 | 296 | 304 | 313 | 321 | 329 | 337 |
| 529 | 346 | 354 | 362 | 370 | 378 | 387 | 395 | 403 | 411 | 419 |
| 530 | 428 | 436 | 444 | 452 | 460 | 469 | 477 | 485 | 493 | 501 |
| 531 | 509 | 518 | 526 | 534 | 542 | 550 | 558 | 567 | 575 | 583 |
| 532 | 591 | 599 | 607 | 616 | 624 | 632 | 640 | 648 | 656 | 665 |
| 533 | 673 | 681 | 689 | 697 | 705 | 713 | 722 | 730 | 738 | 746 |
| 534 | 754 | 762 | 770 | 779 | 787 | 795 | 803 | 811 | 819 | 827 |
| 535 | 835 | 843 | 852 | 860 | 868 | 876 | 884 | 892 | 900 | 908 |
| 536 | 916 | 925 | 933 | 941 | 949 | 957 | 965 | 973 | 981 | 989 |
| 537 | 997 | *006 | *014 | *022 | *030 | *038 | *046 | *054 | *062 | *070 |
| 538 | 73078 | 086 | 094 | 102 | 111 | 119 | 127 | 135 | 143 | 151 |
| 539 | 159 | 167 | 175 | 183 | 191 | 199 | 207 | 215 | 223 | 231 |

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| 540 | 73239 | 247 | 255 | 263 | 272 | 280 | 288 | 296 | 304 | 312 |
| 541 | 320 | 328 | 336 | 344 | 352 | 360 | 368 | 376 | 384 | 392 |
| 542 | 400 | 408 | 416 | 424 | 432 | 440 | 448 | 456 | 464 | 472 |
| 543 | 480 | 488 | 496 | 504 | 512 | 520 | 528 | 536 | 544 | 552 |
| 544 | 560 | 568 | 576 | 584 | 592 | 600 | 608 | 616 | 624 | 632 |
| 545 | 640 | 648 | 656 | 664 | 672 | 679 | 687 | 695 | 703 | 711 |
| 546 | 719 | 727 | 735 | 743 | 751 | 759 | 767 | 775 | 783 | 791 |
| 547 | 799 | 807 | 815 | 823 | 830 | 838 | 846 | 854 | 862 | 870 |
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| 551 | 115 | 123 | 131 | 139 | 147 | 155 | 162 | 170 | 178 | 186 |
| 552 | 194 | 202 | 210 | 218 | 225 | 233 | 241 | 249 | 257 | 265 |
| 553 | 273 | 280 | 288 | 296 | 304 | 312 | 320 | 327 | 335 | 343 |
| 554 | 351 | 359 | 367 | 374 | 382. | 390 | 398 | 406 | 414 | 421 |
| 555 | 429 | 437 | 445 | 453 | 461 | 468 | 476 | 484 | 492 | 500 |
| 556 | 507 | 515 | 523 | 531 | 539 | 547 | 554 | 562 | 570 | 578 |
| 557 | 586 | 593 | 601 | 609 | 617 | 624 | 632 | 640 | 648 | 656 |
| 558 | 663 | 671 | 679 | 687 | 695 | 702 | 710 | 718 | 726 | 733 |
| 559 | 741 | 749 | 757 | 764 | 772 | 780 | 788 | 796 | 803 | 811 |
| 560 | 819 | 827 | 834 | 842 | 850 | 858 | 865 | 873 | 881 | 889 |
| 561 | 896 | 904 | 912 | 920 | 927 | 935 | 943 | 950 | 958 | 966 |
| 562 | 974 | 981 | 989 | 997 | *005 | *012 | *020 | *028 | *035 | *043 |
| 563 | 75051 | 059 | 066 | 074 | 082 | 089 | 097 | 105 | 113 | 120 |
| 564 | 128 | 136 | 143 | 151 | 159 | 166 | 174 | 182 | 189 | 197 |
| 565 | 205 | 213 | 220 | 228 | 236 | 243 | 251 | 259 | 266 | 274 |
| 566 | 282 | 289 | 297 | 305 | 312 | 320 | 328 | 335 | 343 | 351 |
| 567 | 358 | 366 | 374 | 381 | 389 | 397 | 404 | 412 | 420 | 427 |
| 568 | 435 | 442 | 450 | 458 | 465 | 473 | 481 | 488 | 496 | 504 |
| 569 | 511 | 519 | 526 | 534 | 542 | 549 | 557 | 565 | 572 | 580 |
| 570 | 587 | 595 | 603 | 610 | 618 | 626 | 633 | 641 | 648 | 656 |
| 571 | 664 | 671 | 679 | 686 | 694 | 702 | 709 | 717 | 724 | 732 |
| 572 | 740 | 747 | 755 | 762 | 770 | 778 | 785 | 793 | 800 | 808 |
| 573 | 815 | 823 | 831 | 838 | 846 | 853 | 861 | 868 | 876 | 884 |
| 574 | 891 | 899 | 906 | 914 | 921 | 929 | 937 | 944 | 952 | 959 |
| 575 | 967 | 974 | 982 | 989 | 997 | *005 | *012 | *020 | *027 | *035 |
| 576 | 76042 | 050 | 057 | 065 | 072 | 080 | 087 | 095 | 103 | 110 |
| 577 | 118 | 125 | 133 | 140 | 148 | 155 | 163 | 170 | 178 | 185 |
| 578 | 193 | 200 | 208 | 215 | 223 | 230 | 238 | 245 | 253 | 260 |
| 579 | 268 | 275 | 283 | 290 | 298 | 305 | 313 | 320 | 328 | 335 |

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
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| 580 | 76343 | 350 | 358 | 365 | 373 | 380 | 388 | 395 | 403 | 410 |
| 581 | 418 | 425 | 433 | 440 | 448 | 455 | 462 | 470 | 477 | 485 |
| 582 | 492 | 500 | 507 | 515 | 522 | 530 | 537 | 545 | 552 | 559 |
| 583 | 567 | 574 | 582 | 589 | 597 | 604 | 612 | 619 | 626 | 634 |
| 584 | 641 | 649 | 656 | 664 | 671 | 678 | 686 | 693 | 701 | 708 |
| 585 | 716 | 723 | 730 | 738 | 745 | 753 | 760 | 768 | 775 | 782 |
| 586 | 790 | 797 | 805 | 812 | 819 | 827 | 834 | 842 | 849 | 856 |
| 587 | 864 | 871 | 879 | 886 | 893 | 901 | 908 | 916 | 923 | 930 |
| 588 | 938 | 945 | 953 | 960 | 967 | 975 | 982 | 989 | 997 | *004 |
| 589 | 77012 | 019 | 026 | 034 | 041 | 048 | 056 | 063 | 070 | 078 |
| 590 | 085 | 093 | 100 | 107 | 115 | 122 | 129 | 137 | 144 | 151 |
| 591 | 159 | 166 | 173 | 181 | 188 | 195 | 203 | 210 | 217 | 225 |
| 592 | 232 | 240 | 247 | 254 | 262 | 269 | 276 | 283 | 291 | 298 |
| 593 | 305 | 313 | 320 | 327 | 335 | 342 | 349 | 357 | 364 | 371 |
| 594 | 379 | 386 | 393 | 401 | 408 | 415 | 422 | 430 | 437 | 444 |
| 595 | 452 | 459 | 466 | 474 | 481 | 488 | 495 | 503 | 510 | 517 |
| 596 | 525 | 532 | 539 | 546 | 554 | 561 | 568 | 576 | 583 | 590 |
| 597 | 597 | 605 | 612 | 619 | 627 | 634 | 641 | 648 | 656 | 663 |
| 598 | 670 | 677 | 685 | 692 | 699 | 706 | 714 | 721 | 728 | 735 |
| 599 | 743 | 750 | 757 | 764 | 772 | 779 | 786 | 793 | 801 | 808 |
| 600 | 815 | 822 | 830 | 837 | 844 | 851 | 859 | 866 | 873 | 880 |
| 601 | 887 | 895 | 902 | 909 | 916 | 924 | 931 | 938 | 945 | 952 |
| 602 | 960 | 967 | 974 | 981 | 988 | 996 | *003 | *010 | *017 | *025 |
| 603 | 78032 | 039 | 046 | 053 | 061 | 068 | 075 | 082 | 089 | 097 |
| 604 | 104 | 111 | 118 | 125 | 132 | 140 | 147 | 154 | 161 | 168 |
| 605 | 176 | 183 | 190 | 197 | 204 | 211 | 219 | 226 | 233 | 240 |
| 606 | 247 | 254 | 262 | 269 | 276 | 283 | 290 | 297 | 305 | 312 |
| 607 | 319 | 326 | 333 | 340 | 347 | 355 | 362 | 369 | 376 | 383 |
| 608 | 390 | 398 | 405 | 412 | 419 | 426 | 433 | 440 | 447 | 455 |
| 609 | 462 | 469 | 476 | 483 | 490 | 497 | 504 | 512 | 519 | 526 |
| 610 | 533 | 540 | 547 | 554 | 561 | 569 | 576 | 583 | 590 | 597 |
| 611 | 604 | 611 | 618 | 625 | 633 | 640 | 647 | 654 | 661 | 668 |
| 612 | 675 | 682 | 689 | 696 | 704 | 711 | 718 | 725 | 732 | 739 |
| 613 | 746 | 753 | 760 | 767 | 774 | 781 | 789 | 796 | 803 | 810 |
| 614 | 817 | 824 | 831 | 838 | 845 | 852 | 859 | 866 | 873 | 880 |
| 615 | 888 | 895 | 902 | 909 | 916 | 923 | 930 | 937 | 944 | 951 |
| 616 | 958 | 965 | 972 | 979 | 986 | 993 | *000 | *007 | *014 | *021 |
| 617 | 79029 | 036 | 043 | 050 | 057 | 064 | 071 | 078 | 085 | 092 |
| 618 | 099 | 106 | 113 | 120 | 127 | 134 | 141 | 148 | 155 | 162 |
| 619 | 169 | 176 | 183 | 190 | 197 | 204 | 211 | 218 | 225 | 232 |

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| 620 | 79239 | 246 | 253 | 260 | 267 | 274 | 281 | 288 | 295 | 302 |
| 621 | 309 | 316 | 323 | 330 | 337 | 344 | 351 | 358 | 365 | 372 |
| 622 | 379 | 386 | 393 | 400 | 407 | 414 | 421 | 428 | 435 | 442 |
| 623 | 449 | 456 | 463 | 470 | 477 | 484 | 491 | 498 | 505 | 511 |
| 624 | 518 | 525 | 532 | 539 | 546 | 553 | 560 | 567 | 574 | 581 |
| 625 | 588 | 595 | 602 | 609 | 616 | 623 | 630 | 637 | 644 | 650 |
| 626 | 657 | 664 | 671 | 678 | 685 | 692 | 699 | 706 | 713 | 720 |
| 627 | 727 | 734 | 741 | 748 | 754 | 761 | 768 | 775 | 782 | 789 |
| 628 | 796 | 803 | 810 | 817 | 824 | 831 | 837 | 844 | 851 | 858 |
| 629 | 865 | 872 | 879 | 886 | 893 | 900 | 906 | 913 | 920 | 927 |
| 630 | 934 | 941 | 948 | 955 | 962 | 969 | 975 | 982 | 989 | 996 |
| 631 | 80003 | 010 | 017 | 024 | 030 | 037 | 044 | 051 | 058 | 065 |
| 632 | 072 | 079 | 085 | 092 | 099 | 106 | 113 | 120 | 127 | 134 |
| 633 | 140 | 147 | 154 | 161 | 168 | 175 | 182 | 188 | 195 | 202 |
| 634 | 209 | 216 | 223 | 229 | 236. | 243 | 250 | 257 | 264 | 271 |
| 635 | 277 | 284 | 291 | 298 | 305 | 312 | 318 | 325 | 332 | 339 |
| 636 | 346 | 353 | 359 | 366 | 373 | 380 | 387 | 393 | 400 | 407 |
| 637 | 414 | 421 | 428 | 434 | 441 | 448 | 455 | 462 | 468 | 475 |
| 638 | 482 | 489 | 496 | 502 | 509 | 516 | 523 | 530 | 536 | 543 |
| 639 | 550 | 557 | 564 | 570 | 577 | 584 | 591 | 598 | 604 | 611 |
| 640 | 618 | 625 | 632 | 638 | 645 | 652 | 659 | 665 | 672 | 679 |
| 641 | 686 | 693 | 699 | 706 | 713 | 720 | 726 | 733 | 740 | 747 |
| 642 | 754 | 760 | 767 | 774 | 781 | 787 | 794 | 801 | 808 | 814 |
| 643 | 821 | 828 | 835 | 841 | 848 | 855 | 862 | 868 | 875 | 882 |
| 644 | 889 | 895 | 902 | 909 | 916 | 922 | 929 | 936 | 943 | 949 |
| 645 | 956 | 963 | 969 | 976 | 983 | 990 | 996 | *003 | *010 | *017 |
| 646 | 81023 | 030 | 037 | 043 | 050 | 057 | 064 | 070 | 077 | 084 |
| 647 | 090 | 097 | 104 | 111 | 117 | 124 | 131 | 137 | 144 | 151 |
| 648 | 158 | 164 | 171 | 178 | 184 | 191 | 198 | 204 | 211 | 218 |
| 649 | 224 | 231 | 238 | 245 | 251 | 258 | 265 | 271 | 278 | 285 |
| 650 | 291 | 298 | 305 | 311 | 318 | 325 | 331 | 338 | 345 | 351 |
| 651 | 358 | 365 | 371 | 378 | 385 | 391 | 398 | 405 | 411 | 418 |
| 652 | 425 | 431 | 438 | 445 | 451 | 458 | 465 | 471 | 478 | 485 |
| 653 | 491 | 498 | 505 | 511 | 518 | 525 | 531 | 538 | 544 | 551 |
| 654 | 558 | 564 | 571 | 578 | 584 | 591 | 598 | 604 | 611 | 617 |
| 655 | 624 | 631 | 637 | 644 | 651 | 657 | 664 | 671 | 677 | 684 |
| 656 | 690 | 697 | 704 | 710 | 717 | 723 | 730 | 737 | 743 | 750 |
| 657 | 757 | 763 | 770 | 776 | 783 | 790 | 796 | 803 | 809 | 816 |
| 658 | 823 | 829 | 836 | 842 | 849 | 856 | 862 | 869 | 875 | 882 |
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| 662 | 086 | 092 | 099 | 105 | 112 | 119 | 125 | 132 | 138 | 145 |
| 663 | 151 | 158 | 164 | 171 | 178 | 184 | 191 | 197 | 204 | 210 |
| 664 | 217 | 223 | 230 | 236 | 243 | 249 | 256 | 263 | 269 | 276 |
| 665 | 282 | 289 | 295 | 302 | 308 | 315 | 321 | 328 | 334 | 341 |
| 666 | 347 | 354 | 360 | 367 | 373 | 380 | 387 | 393 | 400 | 406 |
| 667 | 413 | 419 | 426 | 432 | 439 | 445 | 452 | 458 | 465 | 471 |
| 668 | 478 | 484 | 491 | 497 | 504 | 510 | 517 | 523 | 530 | 536 |
| 669 | 543 | 549 | 556 | 562 | 569 | 575 | 582 | 588 | 595 | 601 |
| 670 | 607 | 614 | 620 | 627 | 633 | 640 | 646 | 653 | 659 | 666 |
| 671 | 672 | 679 | 685 | 692 | 698 | 705 | 711 | 718 | 724 | 730 |
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| 673 | 802 | 808 | 814 | 821 | 827 | 834 | 840 | 847 | 853 | 860 |
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| 676 | 995 | *001 | *008 | *014 | *020 | *027 | *033 | *040 | *046 | *052 |
| 677 | 83059 | 065 | 072 | 078 | 085 | 091 | 097 | 104 | 110 | 117 |
| 678 | 123 | 129 | 136 | 142 | 149 | 155 | 161 | 168 | 174 | 181 |
| 679 | 187 | 193 | 200 | 206 | 213 | 219 | 225 | 232 | 238 | 245 |
| 680 | 251 | 257 | 264 | 270 | 276 | 283 | 289 | 296 | 302 | 308 |
| 681 | 315 | 321 | 327 | 334 | 340 | 347 | 353 | 359 | 366 | 372 |
| 682 | 378 | 385 | 391 | 398 | 404 | 410 | 417 | 423 | 429 | 436 |
| 683 | 442 | 448 | 455 | 461 | 467 | 474 | 480 | 487 | 493 | 499 |
| 684 | 506 | 512 | 518 | 525 | 531 | 537 | 544 | 550 | 556 | 563 |
| 685 | 569 | 575 | 582 | 588 | 594 | 601 | 607 | 613 | 620 | 626 |
| 686 | 632 | 639 | 645 | 651 | 658 | 664 | 670 | 677 | 683 | 689 |
| 687 | 696 | 702 | 708 | 715 | 721 | 727 | 734 | 740 | 746 | 753 |
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| 689 | 822 | 828 | 835 | 841 | 847 | 853 | 860 | 866 | 872 | 879 |
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| 693 | 073 | 080 | 086 | 092 | 098 | 105 | 111 | 117 | 123 | 130 |
| 694 | 136 | 142 | 148 | 155 | 161 | 167 | 173 | 180 | 186 | 192 |
| 695 | 198 | 205 | 211 | 217 | 223 | 230 | 236 | 242 | 248 | 255 |
| 696 | 261 | 267 | 273 | 280 | 286 | 292 | 298 | 305 | 311 | 317 |
| 697 | 323 | 330 | 336 | 342 | 348 | 354 | 361 | 367 | 373 | 379 |
| 698 | 386 | 392 | 398 | 404 | 410 | 417 | 423 | 429 | 435 | 442 |
| 699 | 448 | 454 | 460 | 466 | 473 | 479 | 485 | 491 | 497 | 504 |

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| 700 | 84510 | 516 | 522 | 528 | 535 | 541 | 547 | 553 | 559 | 566 |
| 701 | 572 | 578 | 584 | 590 | 597 | 603 | 609 | 615 | 621 | 628 |
| 702 | 634 | 640 | 646 | 652 | 658 | 665 | 671 | 677 | 683 | 689 |
| 703 | 696 | 702 | 708 | 714 | 720 | 726 | 733 | 739 | 745 | 751 |
| 704 | 757 | 763 | 770 | 776 | 782 | 788 | 794 | 800 | 807 | 813 |
| 705 | 819 | 825 | 831 | 837 | 844 | 850 | 856 | 862 | 868 | 874 |
| 706 | 880 | 887 | 893 | 899 | 905 | 911 | 917 | 924 | 930 | 936 |
| 707 | 942 | 948 | 954 | 960 | 967 | 973 | 979 | 985 | 991 | 997 |
| 708 | 85003 | 009 | 016 | 022 | 028 | 034 | 040 | 046 | 052 | 058 |
| 709 | 065 | 071 | 077 | 083 | 089 | 095 | 101 | 107 | 114 | 120 |
| 710 | 126 | 132 | 138 | 144 | 150 | 156 | 163 | 169 | 175 | 181 |
| 711 | 187 | 193 | 199 | 205 | 211 | 217 | 224 | 230 | 236 | 242 |
| 712 | 248 | 254 | 260 | 266 | 272 | 278 | 285 | 291 | 297 | 303 |
| 713 | 309 | 315 | 321 | 327 | 333 | 339 | 345 | 352 | 358 | 364 |
| 714 | 370 | 376 | 382 | 388 | 394 | 400 | 406 | 412 | 418 | 425 |
| 715 | 431 | 437 | 443 | 449 | 455 | 461 | 467 | 473 | 479 | 485 |
| 716 | 491 | 497 | 503 | 509 | 516 | 522 | 528 | 534 | 540 | 546 |
| 717 | 552 | 558 | 564 | 570 | 576 | 582 | 588 | 594 | 600 | 606 |
| 718 | 612 | 618 | 625 | 631 | 637 | 643 | 649 | 655 | 661 | 667 |
| 719 | 673 | 679 | 685 | 691 | 697 | 703 | 709 | 715 | 721 | 727 |
| 720 | 733 | 739 | 745 | 751 | 757 | 763 | 769 | 775 | 781 | 788 |
| 721 | 794 | 800 | 806 | 812 | 818 | 824 | 830 | 836 | 842 | 848 |
| 722 | 854 | 860 | 866 | 872 | 878 | 884 | 890 | 896 | 902 | 908 |
| 723 | 914 | 920 | 926 | 932 | 938 | 944 | 950 | 956 | 962 | 968 |
| 724 | 974 | 980 | 986 | 992 | 998 | *004 | *010 | *016 | *022 | *028 |
| 725 | 86034 | 040 | 046 | 052 | 058 | 064 | 070 | 076 | 082 | 088 |
| 726 | 094 | 100 | 106 | 112 | 118 | 124 | 130 | 136 | 141 | 147 |
| 727 | 153 | 159 | 165 | 171 | 177 | 183 | 189 | 195 | 201 | 207 |
| 728 | 213 | 219 | 225 | 231 | 237 | 243 | 249 | 255 | 261 | 267 |
| 729 | 273 | 279 | 285 | 291 | 297 | 303 | 308 | 314 | 320 | 326 |
| 730 | 332 | 338 | 344 | 350 | 356 | 362 | 368 | 374 | 380 | 386 |
| 731 | 392 | 398 | 404 | 410 | 415 | 421 | 427 | 433 | 439 | 445 |
| 732 | 451 | 457 | 463 | 469 | 475 | 481 | 487 | 493 | 499 | 504 |
| 733 | 510 | 516 | 522 | 528 | 534 | 540 | 546 | 552 | 558 | 564 |
| 734 | 570 | 576 | 581 | 587 | 593 | 599 | 605 | 611 | 617 | 623 |
| 735 | 629 | 635 | 641 | 646 | 652 | 658 | 664 | 670 | 676 | 682 |
| 736 | 688 | 694 | 700 | 705 | 711 | 717 | 723 | 729 | 735 | 741 |
| 737 | 747 | 753 | 759 | 764 | 770 | 776 | 782 | 788 | 794 | 800 |
| 738 | 806 | 812 | 817 | 823 | 829 | 835 | 841 | 847 | 853 | 859 |
| 739 | 864 | 870 | 876 | 882 | 888 | 894 | 900 | 906 | 911 | 917 |

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 740 | 86923 | 929 | 935 | 941 | 947 | 953 | 958 | 964 | 970 | 976 |
| 741 | 982 | 988 | 994 | 999 | *005 | *011 | *017 | *023 | *029 | *035 |
| 742 | 87040 | 046 | 052 | 058 | 064 | 070 | 075 | 081 | 087 | 093 |
| 743 | 099 | 105 | 111 | 116 | 122 | 128 | 134 | 140 | 146 | 151 |
| 744 | 157 | 163 | 169 | 175 | 181 | 186 | 192 | 198 | 204 | 210 |
| 745 | 216 | 221 | 227 | 233 | 239 | 245 | 251 | 256 | 262 | 268 |
| 746 | 274 | 280 | 286 | 291 | 297 | 303 | 309 | 315 | 320 | 326 |
| 747 | 332 | 338 | 344 | 349 | 355 | 361 | 367 | 373 | 379 | 384 |
| 748 | 390 | 396 | 402 | 408 | 413 | 419 | 425 | 431 | 437 | 442 |
| 749 | 448 | 454 | 460 | 466 | 471 | 477 | 483 | 489 | 495 | 500 |
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| 751 | 564 | 570 | 576 | 581 | 587 | 593 | 599 | 604 | 610 | 616 |
| 752 | 622 | 628 | 633 | 639 | 645 | 651 | 656 | 662 | 668 | 674 |
| 753 | 679 | 685 | 691 | 697 | 703 | 708 | 714 | 720 | 726 | 731 |
| 754 | 737 | 743 | 749 | 754 | 760 | 766 | 772 | 777 | 783 | 789 |
| 755 | 795 | 800 | 806 | 812 | 818 | 823 | 829 | 835 | 841 | 846 |
| 756 | 852 | 858 | 864 | 869 | 875 | 881 | 887 | 992 | 898 | 904 |
| 757 | 910 | 915 | 921 | 927 | 933 | 938 | 944 | 950 | 955 | 961 |
| 758 | 967 | 973 | 978 | 984 | 990 | 996 | *001 | *007 | *013 | *018 |
| 759 | 88024 | 030 | 036 | 041 | 047 | 053 | 058 | 064 | 070 | 076 |
| 760 | 081 | 087 | 093 | 098 | 104 | 110 | 116 | 121 | 127 | 133 |
| 761 | 138 | 144 | 150 | 156 | 161 | 167 | 173 | 178 | 184 | 190 |
| 762 | 195 | 201 | 207 | 213 | 218 | 224 | 230 | 235 | 241 | 247 |
| 763 | 252 | 258 | 264 | 270 | 275 | 281 | 287 | 292 | 298 | 304 |
| 764 | 309 | 315 | 321 | 326 | 332 | 338 | 343 | 349 | 355 | 360 |
| 765 | 366 | 372 | 377 | 383 | 389 | 395 | 400 | 406 | 412 | 417 |
| 766 | 423 | 429 | 434 | 440 | 446 | 451 | 457 | 463 | 468 | 474 |
| 767 | 480 | 485 | 491 | 497 | 502 | 508 | 513 | 519 | 525 | 530 |
| 768 | 536 | 542 | 547 | 553 | 559 | 564 | 570 | 576 | 581 | 587 |
| 769 | 593 | 598 | 604 | 610 | 615 | 621 | 627 | 632 | 638 | 643 |
| 770 | 649 | 655 | 660 | 666 | 672 | 677 | 683 | 689 | 694 | 700 |
| 771 | 705 | 711 | 717 | 722 | 728 | 734 | 739 | 745 | 750 | 756 |
| 772 | 762 | 767 | 773 | 779 | 784 | 790 | 795 | 801 | 807 | 812 |
| 773 | 818 | 824 | 829 | 835 | 840 | 846 | 852 | 857 | 863 | 868 |
| 774 | 874 | 880 | 885 | 891 | 897 | 902 | 908 | 913 | 919 | 925 |
| 775 | 930 | 936 | 941 | 947 | 953 | 958 | 964 | 969 | 975 | 981 |
| 776 | 986 | 992 | 997 | *003 | *009 | *014 | *020 | *025 | *031 | *037 |
| 777 | 89042 | 048 | 053 | 059 | 064 | 070 | 076 | 081 | 087 | 092 |
| 778 | 098 | 104 | 109 | 115 | 120 | 126 | 131 | 137 | 143 | 148 |
| 779 | 154 | 159 | 165 | 170 | 176 | 182 | 187 | 193 | 198 | 204 |

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 780 | 89209 | 215 | 221 | 226 | 232 | 237 | 243 | 248 | 254 | 260 |
| 781 | 265 | 271 | 276 | 282 | 287 | 293 | 298 | 304 | 310 | 315 |
| 782 | 321 | 326 | 332 | 337 | 343 | 348 | 354 | 360 | 365 | 371 |
| 783 | 376 | 382 | 387 | 393 | 398 | 404 | 409 | 415 | 421 | 426 |
| 784 | 432 | 437 | 443 | 448 | 454 | 459 | 465 | 470 | 476 | 481 |
| 785 | 487 | 492 | 498 | 504 | 509 | 515 | 520 | 526 | 531 | 537 |
| 786 | 542 | 548 | 553 | 559 | 564 | 570 | 575 | 581 | 586 | 592 |
| 787 | 597 | 603 | 609 | 614 | 620 | 625 | 631 | 636 | 642 | 647 |
| 788 | 653 | 658 | 664 | 669 | 675 | 680 | 686 | 691 | 697 | 702 |
| 789 | 708 | 713 | 719 | 724 | 730 | 735 | 741 | 746 | 752 | 757 |
| 790 | 763 | 768 | 774 | 779 | 785 | 790 | 796 | 801 | 807 | 812 |
| 791 | 818 | 823 | 829 | 834 | 840 | 845 | 851 | 856 | 862 | 867 |
| 792 | 873 | 878 | 883 | 889 | 894 | 900 | 905 | 911 | 916 | 922 |
| 793 | 927 | 933 | 938 | 944 | 949 | 955 | 960 | 966 | 971 | 977 |
| 794 | 982 | 988 | 993 | 998 | *004 | *009 | *015 | *020 | *026 | *031 |
| 795 | 90037 | 042 | 048 | 053 | 059 | 064 | 069 | 075 | 080 | 086 |
| 796 | 091 | 097 | 102 | 108 | 113 | 119 | 124 | 129 | 135 | 140 |
| 797 | 146 | 151 | 157 | 162 | 168 | 173 | 179 | 184 | 189 | 195 |
| 798 | 200 | 206 | 211 | 217 | 222 | 227 | 233 | 238 | 244 | 249 |
| 799 | 255 | 260 | 266 | 271 | 276 | 282 | 287 | 293 | 298 | 304 |
| 800 | 309 | 314 | 320 | 325 | 331 | 336 | 342 | 347 | 352 | 358 |
| 801 | 363 | 369 | 374 | 380 | 385 | 390 | 396 | 401 | 407 | 412 |
| 802 | 417 | 423 | 428 | 434 | 339 | 445 | 450 | 455 | 461 | 466 |
| 803 | 472 | 477 | 482 | 488 | 493* | 499 | 504 | 509 | 515 | 520 |
| 804 | 526 | 531 | 536 | 542 | 547 | 553 | 558 | 563 | 569 | 574 |
| 805 | 580 | 585 | 590 | 596 | 601 | 607 | 612 | 617 | 623 | 628 |
| 806 | 634 | 639 | 644 | 650 | 655 | 660 | 666 | 671 | 677 | 682 |
| 807 | 687 | 693 | 698 | 703 | 709 | 714 | 720 | 725 | 730 | 736 |
| 808 | 741 | 747 | 752 | 757 | 763 | 768 | 773 | 779 | 784 | 789 |
| 809 | 795 | 800 | 806 | 811 | 816 | 822 | 827 | 832 | 838 | 843 |
| 810 | 849 | 854 | 859 | 865 | 870 | 875 | 881 | 886 | 891 | 897 |
| 811 | 902 | 907 | 913 | 818 | 924 | 929 | 934 | 940 | 945 | 950 |
| 812 | 956 | 961 | 966 | 972 | 977 | 982 | 988 | 993 | 998 | *004 |
| 813 | 91009 | 014 | 020 | 025 | 030 | 036 | 041 | 046 | 052 | 057 |
| 814 | 062 | 068 | 073 | 078 | 084 | 089 | 094 | 100 | 105 | 110 |
| 815 | 116 | 121 | 126 | 132 | 137 | 142 | 148 | 153 | 158 | 164 |
| 816 | 169 | 174 | 180 | 185 | 190 | 196 | 201 | 206 | 212 | 217 |
| 817 | 222 | 228 | 233 | 238 | 243 | 249 | 254 | 259 | 265 | 270 |
| 818 | 275 | 281 | 386 | 291 | 297 | 302 | 307 | 312 | 318 | 323 |
| 819 | 328 | 334 | 339 | 344 | 350 | 355 | 360 | 365 | 371 | 376 |

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 820 | 91381 | 387 | 392 | 397 | 403 | 408 | 413 | 418 | 424 | 429 |
| 821 | 434 | 440 | 445 | 450 | 455 | 461 | 466 | 471 | 477 | 482 |
| 822 | 487 | 492 | 498 | 503 | 508 | 514 | 519 | 524 | 529 | 535 |
| 823 | 540 | 545 | 551 | 556 | 561 | 566 | 572 | 577 | 582 | 587 |
| 824 | 593 | 598 | 603 | 609 | 614 | 619 | 624 | 630 | 635 | 640 |
| 825 | 645 | 651 | 656 | 661 | 666 | 672 | 677 | 682 | 687 | 693 |
| 826 | 698 | 703 | 709 | 714 | 719 | 724 | 730 | 735 | 740 | 745 |
| 827 | 751 | 756 | 761 | 766 | 772 | 777 | 782 | 787 | 793 | 798 |
| 828 | 803 | 808 | 814 | 819 | 824 | 829 | 834 | 840 | 845 | 850 |
| 829 | 855 | 861 | 866 | 871 | 876 | 882 | 887 | 892 | 897 | 903 |
| 830 | 908 | 913 | 918 | 924 | 929 | 934 | 939 | 944 | 950 | 955 |
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| 833 | 065 | 070 | 075 | 080 | 085 | 091 | 096 | 101 | 106 | 111 |
| 834 | 117 | 122 | 127 | 132 | 137 | 143 | 148 | 153 | 158 | 163 |
| 835 | 169 | 174 | 179 | 184 | 189 | 195 | 200 | 205 | 210 | 215 |
| 836 | 221 | 226 | 231 | 236 | 241 | 247 | 252 | 257 | 262 | 267 |
| 837 | 273 | 278 | 283 | 288 | 293 | 298 | 304 | 309 | 314 | 319 |
| 838 | 324 | 330 | 335 | 340 | 345 | 350 | 355 | 361 | 366 | 371 |
| 839 | 376 | 381 | 387 | 392 | 397 | 402 | 407 | 412 | 418 | 423 |
| 840 | 428 | 433 | 438 | 443 | 449 | 454 | 459 | 464 | 469 | 474 |
| 841 | 480 | 485 | 490 | 495 | 500 | 505 | 511 | 516 | 521 | 526 |
| 842 | 531 | 536 | 542 | 547 | 552 | 557 | 562 | 567 | 572 | 578 |
| 843 | 583 | 588 | 593 | 598 | 603 | 609 | 614 | 619 | 624 | 629 |
| 844 | 634 | 639 | 645 | 650 | 655 | 660 | 665 | 670 | 675 | 681 |
| 845 | 686 | 691 | 696 | 701 | 706 | 711 | 716 | 722 | 727 | 782 |
| 846 | 737 | 742 | 747 | 752 | 758 | 763 | 768 | 773 | 778 | 783 |
| 847 | 788 | 793 | 799 | 804 | 809 | 814 | 819 | 824 | 829 | 834 |
| 848 | 840 | 845 | 850 | 855 | 860 | 865 | 870 | 875 | 881 | 886 |
| 849 | 891 | 896 | 901 | 906 | 911 | 916 | 921 | 927 | 932 | 937 |
| 850 | 942 | 947 | 952 | 957 | 962 | 967 | 973 | 978 | 983 | 988 |
| 851 | 993 | 998 | *003 | *008 | *013 | *018 | *024 | *029 | *034 | *039 |
| 852 | 93044 | 049 | 054 | 059 | 064 | 069 | 075 | 080 | 085 | 090 |
| 853 | 095 | 100 | 105 | 110 | 115 | 120 | 125 | 131 | 136 | 141 |
| 854 | 146 | 151 | 156 | 161 | 166 | 171 | 176 | 181 | 186 | 192 |
| 855 | 197 | 202 | 207 | 212 | 217 | 222 | 227 | 232 | 237 | 242 |
| 856 | 247 | 252 | 258 | 263 | 268 | 273 | 278 | 283 | 288 | 293 |
| 857 | 298 | 303 | 308 | 313 | 318 | 323 | 328 | 334 | 339 | 344 |
| 858 | 349 | 354 | 359 | 364 | 369 | 374 | 379 | 384 | 389 | 394 |
| 859 | 399 | 404 | 409 | 414 | 420 | 425 | 430 | 435 | 440 | 445 |

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 860 | 93450 | 455 | 460 | 465 | 470 | 475 | 480 | 485 | 490 | 495 |
| 861 | 500 | 505 | 510 | 515 | 520 | 526 | 531 | 536 | 541 | 546 |
| 862 | 551 | 556 | 561 | 566 | 571 | 576 | 581 | 586 | 591 | 596 |
| 863 | 601 | 606 | 611 | 616 | 621 | 626 | 631 | 636 | 641 | 646 |
| 864 | 651 | 656 | 661 | 666 | 671 | 676 | 682 | 687 | 692 | 697 |
| 865 | 702 | 707 | 712 | 717 | 722 | 727 | 732 | 737 | 742 | 747 |
| 866 | 752 | 757 | 762 | 767 | 772 | 777 | 782 | 787 | 792 | 797 |
| 867 | 802 | 807 | 812 | 817 | 822 | 827 | 832 | 837 | 842 | 847 |
| 868 | 852 | 857 | 862 | 867 | 872 | 877 | 882 | 887 | 892 | 897 |
| 869 | 902 | 907 | 912 | 917 | 922 | 927 | 932 | 937 | 942 | 947 |
| 870 | 952 | 957 | 962 | 967 | 972 | 977 | 982 | 987 | 992 | 997 |
| 871 | 94002 | 007 | 012 | 017 | 022 | 027 | 032 | 037 | 042 | 047 |
| 872 | 052 | 057 | 062 | 067 | 072 | 077 | 082 | 086 | 091 | 096 |
| 873 | 101 | 106 | 111 | 116 | 121 | 126 | 131 | 136 | 141 | 146 |
| 874 | 151 | 156 | 161 | 166 | 171 | 176 | 181 | 186 | 191 | 196 |
| 875 | 201 | 206 | 211 | 216 | 221 | 226 | 231 | 236 | 240 | 245 |
| 876 | 250 | 255 | 260 | 265 | 270 | 275 | 280 | 285 | 290 | 295 |
| 877 | 300 | 305 | 310 | 315 | 320 | 325 | 330 | 335 | 340 | 345 |
| 878 | 349 | 354 | 359 | 364 | 369 | 374 | 379 | 384 | 389 | 394 |
| 879 | 399 | 404 | 409 | 414 | 419 | 424 | 429 | 433 | 438 | 443 |
| 880 | 448 | 453 | 458 | 463 | 468 | 473 | 478 | 483 | 488 | 493 |
| 881 | 498 | 503 | 507 | 512 | 517 | 522 | 527 | 532 | 537 | 542 |
| 882 | 547 | 552 | 557 | 562 | 567 | 571 | 576 | 581 | 586 | 591 |
| 883 | 596 | 601 | 606 | 611 | 616 | 721 | 626 | 630 | 635 | 640 |
| 884 | 645 | 650 | 655 | 660 | 665 | 670 | 675 | 680 | 685 | 689 |
| 885 | 694 | 699 | 704 | 709 | 714 | 719 | 724 | 729 | 734 | 738 |
| 886 | 743 | 748 | 753 | 758 | 763 | 768 | 773 | 778 | 783 | 787 |
| 887 | 792 | 797 | 802 | 807 | 812 | 817 | 822 | 827 | 832 | 836 |
| 888 | 841 | 846 | 851 | 856 | 861 | 866 | 871 | 876 | 880 | 885 |
| 889 | 890 | 895 | 900 | 905 | 910 | 915 | 919 | 924 | 929 | 934 |
| 890 | 939 | 944 | 949 | 954 | 959 | 963 | 968 | 973 | 978 | 983 |
| 891 | 988 | 993 | 998 | *002 | *007 | *012 | *017 | *022 | *027 | *032 |
| 892 | 95036 | 041 | 046 | 051 | 056 | 061 | 066 | 071 | 075 | 080 |
| 893 | 085 | 090 | 095 | 100 | 105 | 109 | 114 | 119 | 124 | 129 |
| 894 | 134 | 139 | 143 | 148 | 153 | 158 | 163 | 168 | 173 | 177 |
| 895 | 182 | 187 | 192 | 197 | 202 | 207 | 211 | 216 | 221 | 226 |
| 896 | 231 | 236 | 240 | 245 | 250 | 255 | 260 | 265 | 270 | 274 |
| 897 | 279 | 284 | 289 | 294 | 299 | 303 | 308 | 313 | 318 | 423 |
| 898 | 328 | 332 | 337 | 342 | 347 | 352 | 357 | 361 | 366 | 371 |
| 899 | 376 | 381 | 386 | 390 | 395 | 400 | 405 | 410 | 415 | 419 |

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 900 | 95424 | 429 | 434 | 439 | 444 | 448 | 453 | 458 | 463 | 468 |
| 901 | 472 | 477 | 482 | 487 | 492 | 497 | 501 | 506 | 511 | 516 |
| 902 | 521 | 525 | 530 | 535 | 540 | 545 | 550 | 554 | 559 | 564 |
| 903 | 569 | 574 | 578 | 583 | 588 | 593 | 598 | 602 | 607 | 612 |
| 904 | 617 | 622 | 626 | 631 | 636 | 641 | 646 | 650 | 655 | 660 |
| 905 | 665 | 670 | 674 | 679 | 684 | 689 | 694 | 698 | 703 | 708 |
| 906 | 713 | 718 | 722 | 727 | 732 | 737 | 742 | 746 | 751 | 756 |
| 907 | 761 | 766 | 770 | 775 | 780 | 785 | 789 | 794 | 799 | 804 |
| 908 | 809 | 813 | 818 | 823 | 828 | 832 | 837 | 842 | 847 | 852 |
| 909 | 856 | 861 | 866 | 871 | 875 | 880 | 885 | 890 | 895 | 899 |
| 910 | 904 | 909 | 914 | 918 | 923 | 928 | 933 | 938 | 942 | 947 |
| 911 | 952 | 957 | 961 | 966 | 971 | 976 | 980 | 985 | 990 | 995 |
| 912 | 999 | *004 | *009 | *014 | *019 | *023 | *028 | *033 | *038 | *042 |
| 913 | 96047 | 052 | 057 | 061 | 066 | 071 | 076 | 080 | 085 | 090 |
| 914 | 095 | 099 | 104 | 109 | 114 | 118 | 123 | 128 | 133 | 137 |
| 915 | 142 | 147 | 152 | 156 | 161 | 166 | 171 | 175 | 180 | 185 |
| 916 | 190 | 194 | 199 | 204 | 209 | 213 | 218 | 223 | 227 | 232 |
| 917 | 237 | 242 | 246 | 251 | 256 | 261 | 265 | 270 | 275 | 280 |
| 918 | 284 | 289 | 294 | 298 | 303 | 308 | 313 | 317 | 322 | 327 |
| 919 | 332 | 336 | 341 | 346 | 350 | 355 | 360 | 365 | 369 | 374 |
| 920 | 379 | 384 | 388 | 393 | 398 | 402 | 407 | 412 | 417 | 421 |
| 921 | 426 | 431 | 435 | 440 | 445 | 450 | 454 | 459 | 464 | 468 |
| 922 | 473 | 478 | 483 | 487 | 492 | 497 | 501 | 506 | 511 | 515 |
| 923 | 520 | 525 | 530 | 534 | 539 | 544 | 548 | 553 | 558 | 562 |
| 924 | 567 | 572 | 577 | 581 | 586 | 591 | 595 | 600 | 605 | 609 |
| 925 | 614 | 619 | 624 | 628 | 633 | 638 | 642 | 647 | 652 | 656 |
| 926 | 661 | 666 | 670 | 675 | 680 | 685 | 689 | 694 | 699 | 703 |
| 927 | 708 | 713 | 717 | 722 | 727 | 731 | 736 | 741 | 745 | 750 |
| 928 | 755 | 759 | 764 | 769 | 774 | 778 | 783 | 788 | 792 | 797 |
| 929 | 802 | 806 | 811 | 816 | 820 | 825 | 830 | 834 | 839 | 844 |
| 930 | 848 | 853 | 858 | 862 | 867 | 872 | 876 | 881 | 886 | 890 |
| 931 | 895 | 900 | 904 | 909 | 914 | 918 | 923 | 928 | 932 | 937 |
| 932 | 942 | 946 | 951 | 956 | 960 | 965 | 970 | 974 | 979 | 984 |
| 933 | 988 | 993 | 997 | *002 | *007 | *011 | *016 | *021 | *025 | *030 |
| 934 | 97035 | 039 | 044 | 049 | 053 | 058 | 063 | 067 | 072 | 077 |
| 935 | 081 | 086 | 090 | 095 | 100 | 104 | 109 | 114 | 118 | 123 |
| 936 | 128 | 132 | 137 | 142 | 146 | 151 | 155 | 160 | 165 | 169 |
| 937 | 174 | 179 | 183 | 188 | 192 | 197 | 202 | 206 | 211 | 216 |
| 938 | 220 | 225 | 230 | 234 | 239 | 243 | 248 | 253 | 257 | 262 |
| 939 | 267 | 271 | 276 | 280 | 285 | 290 | 294 | 299 | 304 | 308 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 940 | 97313 | 317 | 322 | 327 | 331 | 336 | 340 | 345 | 350 | 354 |
| 941 | 359 | 364 | 368 | 373 | 377 | 382 | 387 | 391 | 396 | 400 |
| 942 | 405 | 410 | 414 | 419 | 424 | 428 | 433 | 437 | 442 | 447 |
| 943 | 451 | 456 | 460 | 465 | 470 | 474 | 479 | 483 | 488 | 493 |
| 944 | 497 | 502 | 506 | 511 | 516 | 520 | 525 | 529 | 534 | 539 |
| 945 | 543 | 548 | 552 | 557 | 562 | 566 | 571 | 575 | 580 | 585 |
| 946 | 589 | 594 | 598 | 603 | 607 | 612 | 617 | 621 | 626 | 630 |
| 947 | 635 | 640 | 644 | 649 | 653 | 658 | 663 | 667 | 672 | 676 |
| 948 | 681 | 685 | 690 | 695 | 699 | 704 | 708 | 713 | 717 | 722 |
| 949 | 727 | 731 | 736 | 740 | 745 | 749 | 754 | 759 | 763 | 768 |
| 950 | 772 | 777 | 782 | 786 | 791 | 795 | 800 | 804 | 809 | 813 |
| 951 | 818 | 823 | 827 | 832 | 836 | 841 | 845 | 850 | 855 | 859 |
| 952 | 864 | 868 | 873 | 877 | 882 | 886 | 891 | 896 | 900 | 905 |
| 953 | 909 | 914 | 918 | 923 | 928 | 932 | 937 | 941 | 946 | 950 |
| 954 | 955 | 959 | 964 | 968 | 973 | 978 | 982 | 987 | 991 | 996 |
| 955 | 98000 | 005 | 009 | 014 | 019 | 023 | 028 | 032 | 037 | 041 |
| 956 | 046 | 050 | 055 | 959 | 064 | 068 | 073 | 078 | 082 | 087 |
| 957 | 091 | 096 | 100 | 105 | 109 | 114 | 118 | 123 | 127 | 132 |
| 958 | 137 | 141 | 146 | 150 | 155 | 159 | 164 | 168 | 173 | 177 |
| 959 | 182 | 186 | 191 | 195 | 200 | 204 | 209 | 214 | 218 | 223 |
| 960 | 227 | 232 | 236 | 241 | 245 | 250 | 254 | 259 | 263 | 268 |
| 961 | 272 | 277 | 281 | 286 | 290 | 295 | 299 | 304 | 308 | 313 |
| 962 | 318 | 322 | 327 | 331 | 336 | 340 | 345 | 349 | 354 | 358 |
| 963 | 363 | 367 | 372 | 376 | 381 | 385 | 390 | 394 | 399 | 403 |
| 964 | 408 | 412 | 417 | 421 | 426 | 430 | 435 | 439 | 444 | 448 |
| 965 | 453 | 457 | 462 | 466 | 471 | 475 | 480 | 484 | 489 | 493 |
| 966 | 498 | 502 | 507 | 511 | 516 | 520 | 525 | 529 | 534 | 538 |
| 967 | 543 | 547 | 552 | 556 | 561 | 565 | 570 | 574 | 579 | 583 |
| 968 | 588 | 592 | 597 | 601 | 605 | 610 | 614 | 619 | 623 | 628 |
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| 971 | 722 | 726 | 731 | 735 | 740 | 744 | 749 | 753 | 758 | 762 |
| 972 | 767 | 771 | 776 | 780 | 784 | 789 | 793 | 798 | 802 | 807 |
| 973 | 811 | 816 | 820 | 825 | 829 | 834 | 838 | 843 | 847 | 851 |
| 974 | 856 | 860 | 865 | 869 | 874 | 878 | 883 | 887 | 892 | 896 |
| 975 | 900 | 905 | 909 | 914 | 918 | 923 | 927 | 932 | 936 | 941 |
| 976 | 945 | 949 | 954 | 958 | 963 | 967 | 972 | 976 | 981 | 985 |
| 977 | 989 | 994 | 998 | *003 | *007 | *012 | *016 | *021 | *025 | *029 |
| 978 | 99034 | 038 | 043 | 047 | 052 | 056 | 061 | 065 | 069 | 074 |
| 979 | 078 | 083 | 087 | 092 | 096 | 100 | 105 | 109 | 114 | 118 |

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 980 | 99123 | 127 | 131 | 136 | 140 | 145 | 149 | 154 | 158 | 162 |
| 981 | 167 | 171 | 176 | 180 | 185 | 189 | 193 | 198 | 202 | 207 |
| 982 | 211 | 216 | 220 | 224 | 229 | 233 | 238 | 242 | 247 | 251 |
| 983 | 255 | 260 | 264 | 269 | 273 | 277 | 282 | 286 | 291 | 295 |
| 984 | 300 | 304 | 308 | 313 | 317 | 322 | 326 | 330 | 335 | 339 |
| 985 | 344 | 348 | 352 | 357 | 361 | 366 | 370 | 374 | 379 | 383 |
| 986 | 388 | 392 | 396 | 401 | 405 | 410 | 414 | 419 | 423 | 427 |
| 987 | 432 | 436 | 441 | 445 | 449 | 454 | 458 | 463 | 467 | 471 |
| 988 | 476 | 480 | 484 | 489 | 493 | 498 | 502 | 506 | 511 | 515 |
| 989 | 520 | 524 | 528 | 533 | 537 | 542 | 546 | 550 | 555 | 559 |
| 990 | 564 | 568 | 572 | 577 | 581 | 585 | 590 | 594 | 599 | 603 |
| 991 | 607 | 612 | 616 | 621 | 625 | 629 | 634 | 638 | 642 | 647 |
| 992 | 651 | 656 | 660 | 664 | 669 | 673 | 677 | 682 | 686 | 691 |
| 993 | 695 | 699 | 704 | 708 | 712 | 717 | 721 | 726 | 730 | 734 |
| 994 | 739 | 743 | 747 | 752 | 756 | 760 | 765 | 769 | 774 | 778 |
| 995 | 782 | 787 | 791 | 795 | 800 | 804 | 808 | 813 | 817 | 822 |
| 996 | 826 | 830 | 835 | 839 | 843 | 848 | 852 | 856 | 861 | 865 |
| 997 | 870 | 874 | 878 | 883 | 887 | 891 | 896 | 900 | 904 | 909 |
| 998 | 913 | 917 | 922 | 926 | 930 | 935 | 939 | 944 | 948 | 952 |
| 999 | 957 | 961 | 965 | 970 | 974 | 978 | 983 | 987 | 991 | 996 |